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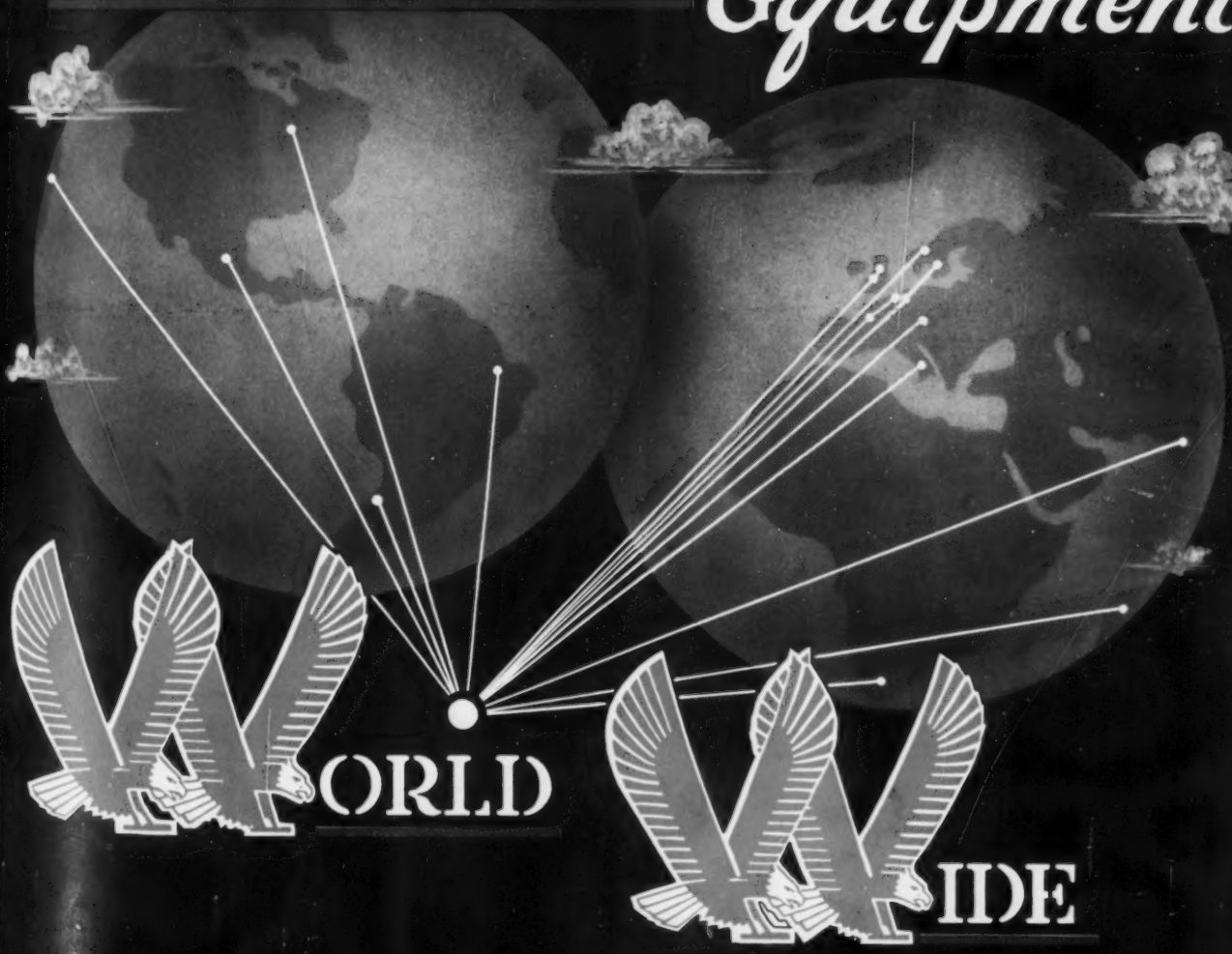
# The Iron Age

NATIONAL METALWORKING WEEKLY

May 17, 1951

NTS PAGE 2

WEAN STEEL MILL
*Equipment is*



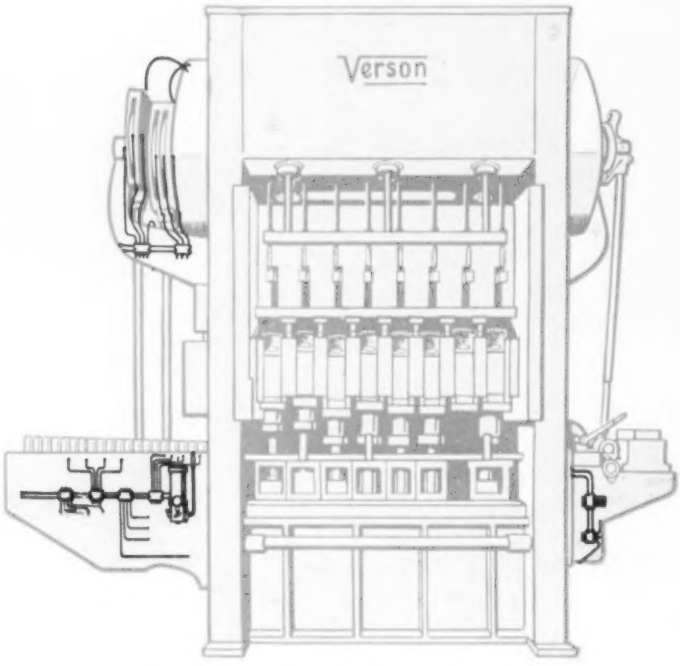
WORLD WIDE

*The* WEAN ENGINEERING COMPANY, INC.
WARREN, OHIO
SPECIALISTS IN SHEET, TIN and STRIP MILL EQUIPMENT

# 30 million stampings without a bearing failure

## ...thanks to Farval lubrication

FARVAL—*Studies in Centralized Lubrication* No. 123




*With a few strokes of the Farval hand lever, every bearing of this big Verson Transmat Press is adequately lubricated. No stopping the machine, no time lost, and never a bearing missed.*

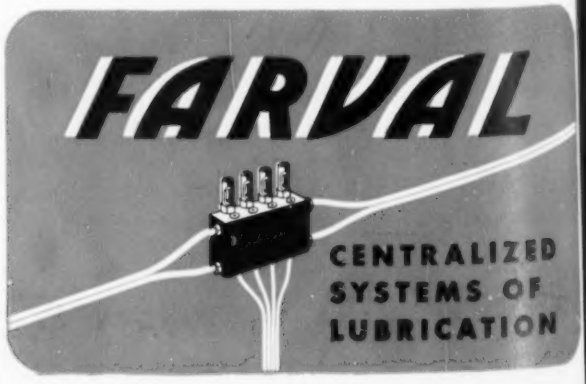
VERSON built and installed this high-speed Transmat Press in a metal-working plant in 1946. It was factory-equipped with a Farval system of Centralized Lubrication. In the five years since its installation, the machine has never been shut down for lubrication, for bearing replacement, or, in fact, for anything other than ordinary preventive maintenance.

The press is used for progressive dieing. Coil stock is fed into the blanking station and then carried by a finger feed for several succeeding operations. It works at the rate of 22 strokes per minute. In continuous operation for five years this press has turned out in excess of 30,000,000 stampings. By eliminating down time for lubrication and repair or replacement of bearings, Farval has contributed importantly to this impressive output—and should continue to do so for years to come.

Farval is the original Dualine system of centralized lubrication proved practical in over 20 years of service. The Farval valve has only 2 moving parts—is simple, sure and foolproof, without springs, ball-checks or pinhole ports to cause trouble. Through its full hydraulic operation, Farval unfailingly delivers grease or oil to each bearing—as much as you want, exactly measured—as often as desired. Indicators at every bearing show that each valve has functioned.

For a full description of Farval, write for Bulletin 25. The Farval Corporation, 3252 East 80th Street, Cleveland 4, Ohio.

*Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Limited*



Iron ore from Bethlehem Steel's Venezuelan mines is handled by these unloaders at the tidewater terminal of Puerto de Hierro. Operating on a 660-ft pier each of these unloaders can handle an average of 450 tons of ore per hour. All of the structures were built of Mayari R.

# Ore Unloaders in Venezuela Constructed of Mayari R

## *less deadweight...higher corrosion-resistance*

These ore unloading towers at the tidewater terminal of Puerto de Hierro, Venezuela, were built entirely from Mayari R, Bethlehem's corrosion-resisting, low-alloy, high-strength steel. Designed to unload river barges, each tower is a huge traveling crane with a clamshell bucket that operates from a hinged horizontal boom. The bucket lifts the ore from the barges and drops it onto a conveyor belt that deposits it on shore where it is stock-piled to provide a backlog for uninterrupted shipments. For the loading operation another system of conveyor belts carries the ore from the stock pile directly to the holds of large ocean-going carriers.

There are two reasons why Mayari R was specified instead of plain structural grade carbon steel. Because of its higher yield point Mayari R could be used in lighter sections to reduce deadweight. Also, because of its superior resistance to corrosion, Mayari R could be expected to last considerably longer than carbon steel in the tropical, seacoast atmosphere.

Mayari R has been used to advantage in hundreds of industrial structures located in many parts of the world. Information on these applications is readily available. Write or phone our nearest sales office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

★ BETHLEHEM STEEL ★

**Mayari R** *makes it lighter...stronger...longer lasting*

# IRON AGE

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# IRON AGE *summary*

*iron and steel industry trends*

**Officials preparing get-tough policy on metal requests . . . Steel half controlled . . . Auto output defies statistical analysis**

**Get-Tough Policy**—Defense production officials are preparing a get-tough policy to deal with inflated requests for metal under the Controlled Materials Plan. This tough policy is being forced upon them by urgent requests from military and so-called "essential" users that total far more than available production of some items. Officials in charge of dividing available output among various factors in the economy know these requests must be squeezed down to realistic size if CMP is to work.

The recent NPA directive ordering a 40 pct cut in all DO orders for nickel is in line with this policy. If this order threatens a vital part of the defense program, additional nickel will be allocated from the reserve pool resulting from the cutback. The directive is encouraging because it indicates official Washington is aware of inflated metal requests—and that they will take steps to bring such requests into line.

**Heavy Hand Needed**—It is obvious that a heavy hand will be needed to squeeze the water out of requests for steel, aluminum and copper under CMP. There's a noted tendency to order well ahead of actual need where items are heavily mortgaged by DO's. This only aggravates an already bad situation. One defense producer told THE IRON AGE this week he has been encouraged by the Air Force to place orders for all aluminum he might conceivably use during the next 12 months. If multiplied, such orders will total a fantastic amount.

**Steel Half Controlled**—Some steel items can't stand much inflation. Structurals, plates and oil country goods traveling the control path are already crowding total output. It is estimated that bar output is about 75 pct controlled—alloy a little more, carbon a little less. Sheets are now about half-free, half-slave. Some other products such as tinplate, rails, merchant pipe and wire remain relatively free of controls. Total steel output, including all items, is about half under control and still rising.

Steel officials believe that percentage set asides for July will be higher than June on every product. If this proves true, some companies who have products such as structurals and plates hovering just under 100 pct control for June will find July quotas taking their total output of these products.

This also highlights the problem of how to allot free tonnage of products equitably when nearly all the output is controlled. How can a mill fairly distribute 3 pct of its plates among its regular customers? And how much will one of the customers benefit from its share of 3 pct of the mill's output? Industry has no clear cut answers to these questions this week. Items near 100 pct control may have to be completely controlled.

**Detroit Miracle**—Auto makers are leaving no stone unturned in their search for alloy bars or semi-finished alloy. Their continued high production defies statistical analysis. One company just bought a large shipment of alloy bar stock from Germany. This is one way they are keeping output high.

Steel production this week is scheduled at 104 pct of rated capacity, unchanged from the past 2 weeks. The industry is well on its way toward another new all-time record for steel produced for a single month.

**(nonferrous summary, p. 138)**

# LINDE'S News of Metalworking

## Braze-Welded Repair Saves Six Months' Production Time

When the base of a 5-ton alligator shear cracked in service, early return to normal plant operation appeared hopeless. Delivery of a new shear was six months away . . . cost $1,800.

But LINDE service engineers suggested braze-welding. Within a few days the shear was back in service—permanently repaired at a cost of only $355. This single braze-welding job saved the manufacturer $1,445 and six months of valuable production time.

Similar typical savings account for widespread industrial acceptance of braze-welding as a quick, easy way to join steel, cast iron, malleable iron, and many dissimilar metals. And routine repairs by braze-welding are often made without dismantling machines. Shut-down time is always kept to a minimum.

Why not save the cost, delivery, and installation time required for that new part? Put the old one back on the job with braze-welding.

Braze-welding is only one of many time- and moneysaving LINDE methods for making, cutting, joining, treating, and forming metals. For further information, call or write our nearest office today.

*Replacement of this $1,400 ring gear would have taken more than six months. Braze-welding at half the cost rebuilt badly worn teeth and restored the gear to service in just a few days.*

### What's News

► One steel company has found their OXWELD C-60 Cutting Blowpipe so effective in reducing large pieces of scrap that they are now purchasing quantities of large-size scrap to process themselves.

► Saran and polystyrene, previously resistant to speedy pulverization, are now being successfully ground by LINDE'S new liquid nitrogen pulverization method. . . . Efficiency is such that the new process pulverizes some previously difficult-to-grind materials at rates over 700 lb. per hr.— using small mill hammers.

► Magnesium hydraulic systems for landing gears were formerly discarded at an airplane shop when pinhole leaks appeared. Now, thanks to HELIARC welding they're repaired at a saving of $500 each.

"LINDE" SERVICE DOESN'T COST — IT PAYS!

LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

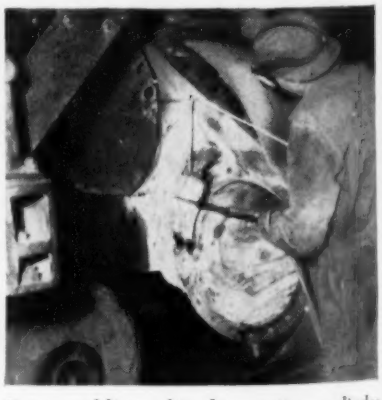
## "Irreplaceable" Cylinder Back at Work in 20 Hours

It looked as if "old faithful" was headed for the scrap pile when overworked pistons snapped and cracked the cylinder of a 1904 model railroad locomotive. To replace the cylinder would have been next to impossible. But braze-welding had "old faithful" back at its lumber mill job in only 20 hours.

Repairs were made without dismantling. After the crack was prepared for welding, the cylinder was covered with asbestos paper and preheated. Then the crack was welded, and the cylinder rebored. Total preheating and welding time was 13 hours.

Repairs cost only $138, including materials, labor, and overhead. Even if the cylinder could have been replaced—at a cost over $4,000—the locomotive would have been idle many months instead of the few hours required to make the repair.

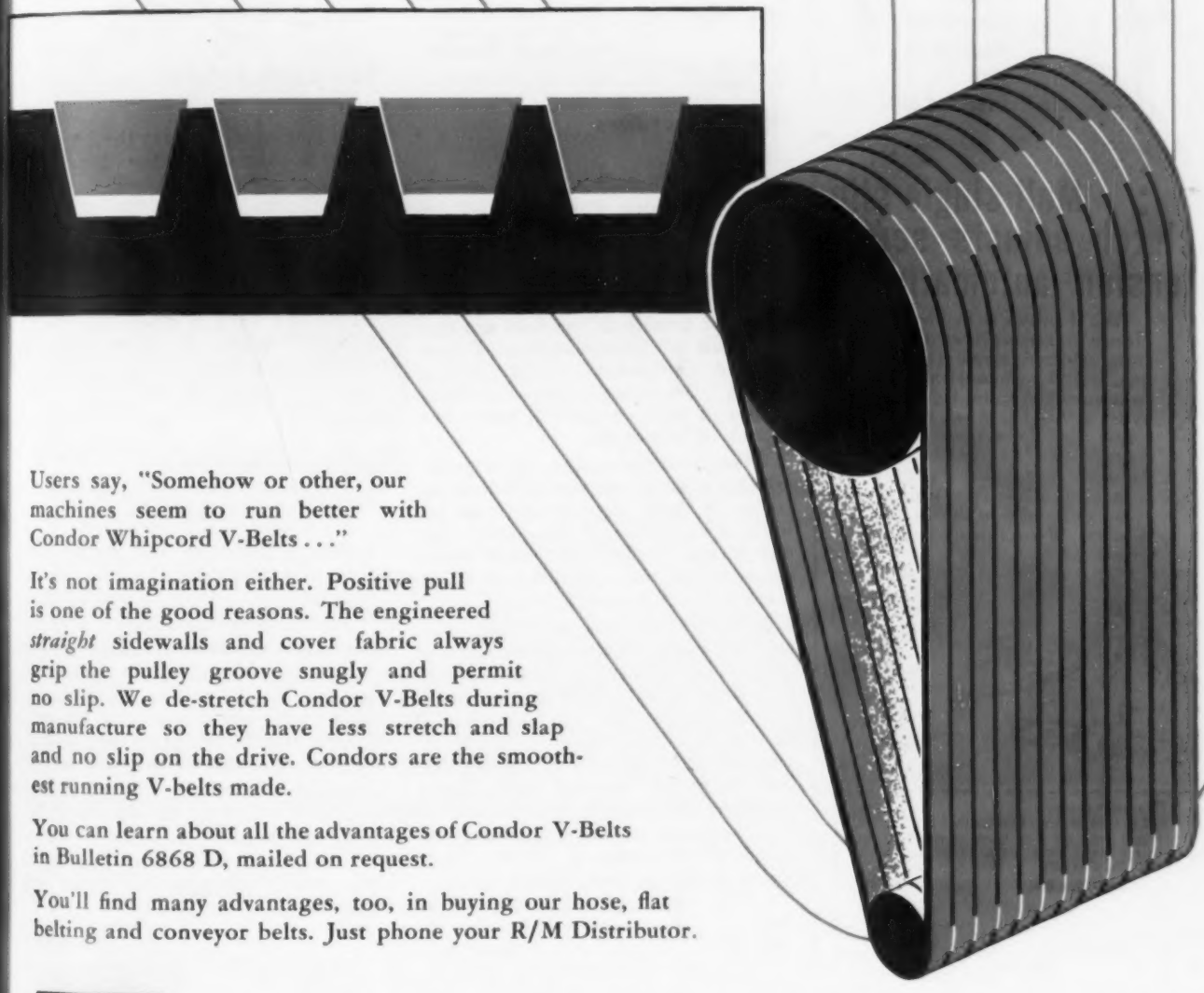
Rapid repair of unavailable or hard-to-get parts is a natural job for braze-welding. Try it yourself, next time you're bothered with a troublesome replacement problem.



*Braze-welding this locomotive cylinder without dismantling saved a lumber company more than $4,000. On special jobs like this, LINDE service and supervision assures success.*

The terms "Heliarc," "Linde," and "Oxweld" are registered trade-marks of Union Carbide and Carbon Corporation.

# *Condor* V-BELTS GRIP THE GROOVES



Users say, "Somehow or other, our machines seem to run better with Condor Whipcord V-Belts . . ."

It's not imagination either. Positive pull is one of the good reasons. The engineered *straight* sidewalls and cover fabric always grip the pulley groove snugly and permit no slip. We de-stretch Condor V-Belts during manufacture so they have less stretch and slap and no slip on the drive. Condors are the smoothest running V-belts made.

You can learn about all the advantages of Condor V-Belts in Bulletin 6868 D, mailed on request.

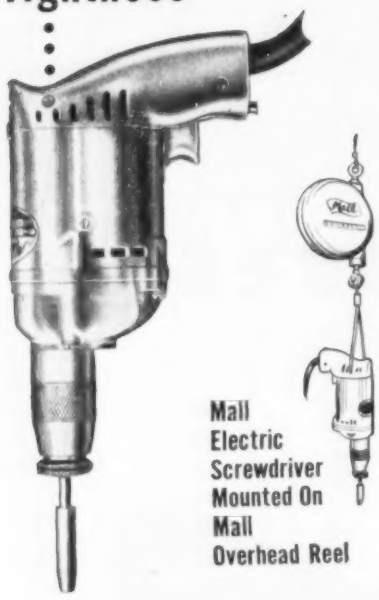
You'll find many advantages, too, in buying our hose, flat belting and conveyor belts. Just phone your R/M Distributor.

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

## RAYBESTOS-MANHATTAN, INC.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose • Fan Belts • Brake Linings • Brake Blocks • Clutch Facings • Packings • Asbestos Textiles • Powdered Metal Products • Abrasive & Diamond Wheels • Bowling Balls

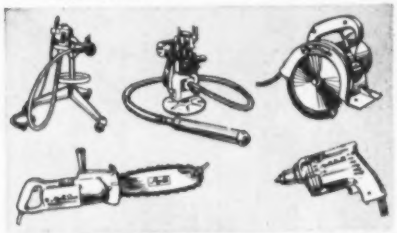
## More Screws Set With Uniform Tightness



Mall Electric Screwdriver Mounted On Mall Overhead Reel

## Mall single slip clutch adjusts screw tension automatically

We'll prove it in your plant. Here's a screwdriver that controls selected screw tension for you. Clutch automatically "slips" to assure the same tightness for every screw. Eliminates stripping screw threads or breaking studs. Adjust clutch tension without dismantling. Constructed of lightweight aluminum alloy. Easy to handle in hard-to-get-at places. Two finder-type bits furnished.



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7785E S. Chicago Ave., Chicago 19, Illinois

☐ Please send me your latest specification data on the MALL PORTABLE ELECTRIC SCREWDRIVER.

☐ I would like a free demonstration in my own plant.

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# Dear EDITOR

*letters from readers*

### Appreciation

Sir:

This note is to express my sincere appreciation for the well written and highly complimentary review of my paper on iron ore beneficiation that you published on p. 104 of your Apr. 12 issue.

You will be interested to learn that I have received a number of inquiries regarding this paper that have mentioned reading about it in THE IRON AGE.

*S. E. ERICKSON*
*Beneficiation Engineer*
*M. A. Hanna Co.*
*Cleveland*

### Plating Rectifiers

Sir:

I wish to comment on the article "Metal Finishing. Forges Ahead" by Adolph Bregman, which appeared in your Feb. 22 issue.

During the past 10 or 11 years, it has been observed that nearly all causes of trouble in the field are due to a lack of understanding of how rectifier equipment should be installed. Occasionally, there is some misuse of such equipment, again due to lack of knowledge.

When rectifier equipment is properly installed it can give excellent results. A vast number of rectifiers were operated two or three shifts per day during the last war period which amounted to the equivalent of 10 or more years of normal service.

Recently, comment was made by a military establishment (whose identity cannot be divulged) on a rectifier unit built in 1941. This unit operated for 24 hr per day all through the war and has been in daily operation since the close of the war. No trouble has occurred in the unit itself. There are other comparable installations.

In contrast to this, an instance is given of a standard rectifier unit which failed in less than 6 months. The unit was returned to the manufacturers who were appalled by its condition. Upon further investigation, it was learned that the rectifier unit, which was small, had been mounted on a wall directly above a tank of hot hydrochloric acid. The user had no complaint (he knew that the installation was bad) but he planned to restore it to the same place after it had been overhauled!

A slight change was made so that the fan could not be turned off, thus preventing the direct intake of hydrochloric acid during the shutdown period, and as far as is known, the unit lasted for the rest of the war. This is an extreme case, of course, but it does show how much installation can vary and how much installation has to do with the life of any piece of electrical equipment.

The Metallic Rectifier Section of the National Electrical Manufacturers Assn. has had a committee working for over 2 years on electroplating rectifier units. Some basic standards have already been developed. Parts I and V have so far been published, on "Definitions" and "Electroplating Metallic Rectifier Units" respectively. One of the next items on the agenda is the preparation and publication of a brochure dealing with the proper installation of electroplating rectifier units.

*L. W. REINKEN*
*Chief Engineer*
*W. Green Electric Co., Inc.*
*New York*

### Tom Swift Returns

Sir:

In your Apr. 26 issue the following item appeared on the Newsfront page: "A tank that will carry its own bridge for spanning small streams, gulleys or traps has been designed."

Do you recall reading as a boy "Tom Swift and His War Tank" in which just such a device was used! In fact, I believe the frontispiece picture illustrated it.

*H. M. PFAHL*
*U. S. Steel Export Co.*
*New York*

### Japanese Inquiry

Sir:

I am very much interested in the article "Ultra-Fast Mill Helps Meet Strip Shortages" by D. I. Brown appearing in your issue of Oct. 26, 1950.

According to the author's explanation, plate can be made ranging from ¼ in. to 1/16 in. thick but the thinner one may not be able to roll by the 4-high single stand reversing hot mill. I guess the thinner plate such as B.S. No. 30 (12/1000 thick) will be fed into the cold rolling mill, after having been rolled by the reversing hot mill. Is that it?

I would be very much obliged if you could enlighten me about this problem.

*T. M. KURETAKE*
*Engineer*
*Kawazoe Machinery Works Ltd.*
*Hyogoke, Japan*

**You guessed right. Hot rolling on continuous or reversing hot mills in this country does not produce gages lighter than 18 gage or 0.049 in. Subsequent cold rolling on these hot bands must be done to reach the lighter gages such as No. 30. —Ed.**

ASK **BAIRD** ABOUT IT!

# HIGH PRODUCTION TOOLING

3820
4521

**BAIRD 54 VERTICAL LATHE**
**showing splash guard for wet operation**

## 4 SPINDLE VERTICAL LATHE

### *with Continuously Revolving turret*

**. . . ELIMINATES NON-PRODUCTIVE INDEXING TIME**

The Baird 54VC lathe was designed for dry or wet cutting of light jobs, boring piston ends, facing, turning bands, ogives, etc. In this specific job, a Pump Rotor was finished on the O.D. and both faces finish turned and chamfered. The tools feed both on the in and out of the cutting stroke. Work is held on an arbor type holding fixture.

The turret, carrying 4 work spindles and 4 sets of tool bars, rotates at 32 seconds per cycle. Thus, one part every 8 seconds . . . 450 pieces per hour. Stock removal is approximately .012" on O.D. and .010" on faces.

Photograph at right shows actual size of pump rotor. See above for operations performed.

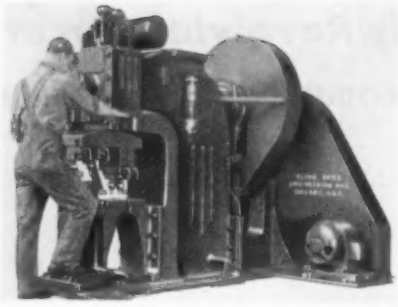
The turret is driven through worm and gears . . . spindles mounted in roller bearing and driven by helical gears. Changes in all speeds are easy and inexpensive. Control stations are within easy reach, the spindle control at left; control at right for turret and tool arms . . . protected to prevent feed of tools to work unless spindles are revolving. All electrical equipment is enclosed, with wiring concealed. The Baird 54 Vertical Lathe is a most versatile machine . . . and a profitable one for work within its range . . . so "ask Baird about it."

**the BAIRD MACHINE COMPANY**
STRATFORD • CONNECTICUT

**AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS**

# NEW *equipment*

**new and improved production ideas, equipment, services and methods described here offer production economies . . . fill in and mail postcard on the opposite page.**



## *Universal punch takes 30-in. I beam*

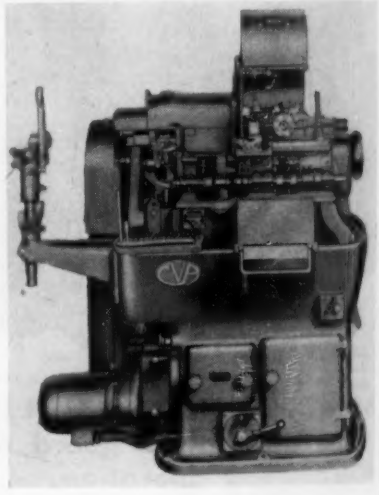
The new No. 7 universal punch has a rating of 118 tons, and a 7½ hp motor drives the flywheel through V belts. The machine has a capacity of punching a 1¼-in. hole through 1-in. material in the center of the ram, and a 1 3/16-in. hole through ¾ in. at 10½ in. from ram center. Die blocks enable the operator to punch in the flanges and webs of beams and channels from 3 through 30 in., in most cases without changing setups. *Kling Bros. Engineering Works.*

**For more data insert No. 1 on postcard.**

## *High speed single spindle automatic*

This British automatic screw machine is manufactured to extremely high tolerances, designed for high speed production with accuracy. It takes standard American collets and attachments and is equipped with American motors. All threads are American thread sizes. Two sets of change gears provide 36 spindle speeds ranging from 200 to 6020 rpm, with ratios of 3:1 or 5:1. The machine produces components from bar stock of any suitable standard section at high speed and with consistent accuracy. All parts are easily accessible for rapid changeover from one job to another. Ample rigidity at high speeds and under heavy loads is a feature and special care and attention has been given to the materials and heat treatment of highly stressed members to ensure long life, even under the most exacting working conditions. A safety clutch is interposed in the driving mechanism to disengage should undue load be imposed. *British Industries Corp.*

**For more data insert No. 2 on postcard.**



## *Fork lift truck powered by diesel engine*

A new diesel-powered lift truck with fluid transmission offers safety, operational and maintenance features. Called the Diesel-Lift, this truck is designed for applications where fire hazards exist, where there is a limited amount of fresh air, and in out-door areas where continuous heavy-duty operation is a necessity. The truck utilizes a Hercules six cylinder diesel engine with continuous rating of 70 hp and a condenser type water muffler screens out sparks in the exhaust gases for safety. Structurally the Diesel-Lift is built of pressed plate and bar steel, formed to shape, and electrically welded into a unit structure. The elevating fork carriage and telescopic channels are carried on bearings. The truck drives like an automobile, all controls within easy reach. *Yale & Towne Mfg. Co.*

**For more data insert No. 3 on postcard.**

*Turn to page 36*

SIMPLIFY YOUR POWER MOTION PROBLEMS...WITH

# Hanna

HYDRAULIC AND PNEUMATIC

## Cylinders and Valves

SMOOTH ECONOMICAL POWER FOR PUSHING, PULLING, LIFTING, PRESSING, CLAMPING OR CONTROLLING

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SOLENOID VALVE

UNITITE VALVE

¼" UNITITE Jr. VALVE

MASTAIR VALVE

FLO-SET SPEED CONTROL VALVE

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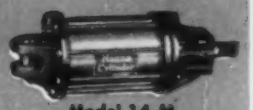
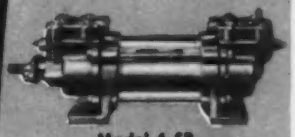
VALVES
Catalog 254

Model 18-M PNEUMATIC CYLINDER


Model 14-M PNEUMATIC CYLINDER

Model 10-M PNEUMATIC CYLINDER


Model 4-SB PNEUMATIC CYLINDER

Model HP-4 HYDRAULIC CYLINDER

Model HP-14 HYDRAULIC CYLINDER

Model HP-25 HYDRAULIC CYLINDER

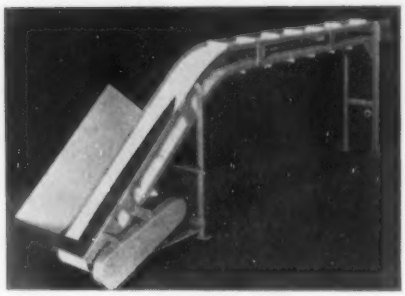
Model HP-17 HYDRAULIC CYLINDER

**For 50 Years . . .**
Hanna Has Designed, Engineered and Built The Finest Quality Products

## Hanna Engineering Works

HYDRAULIC AND PNEUMATIC EQUIPMENT . . . CYLINDERS . . . VALVES . . . RIVETERS

1765 ELSTON AVE., CHICAGO 22, ILL.



## Conveyer for light-duty use

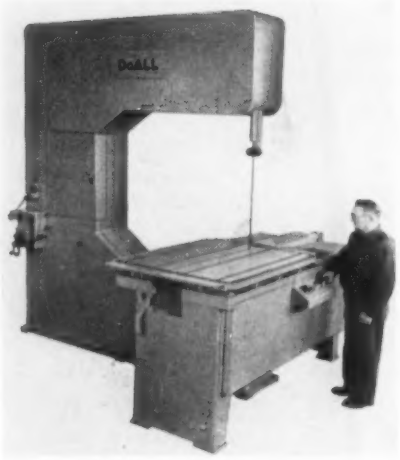
A new conveyer, especially adapted to packaging operations or where small light materials are to be conveyed, can be placed at the dispensing end of a packaging machine, transporting the packages to the place where the boxing operation is performed. The conveyer belt is woven fabric and lugs are washable canvas. Driving power is supplied by a ¼ hp motor. Flexible design permits variations in lengths. *Klaas Machine & Mfg. Co.*

**For more data insert No. 8 on postcard, p. 35.**

## Tumble finishing machines

Used in aircraft, armaments and other metalworking operations, improved tumble finishing machines deburr and smooth rough edges and sharp corners at low cost. Crown buffer strip lining makes possible on-the-spot replacement, keeping at a minimum the downtime for lining renewal. Semi-soft rubber linings are also available. A variable speed drive gives a wide choice of speeds for processing steel die cast or other metal parts. An automatic timer control assures a definite operating time thus avoiding the over or under-running of work during the processing period. New lightweight doors have full-grip door lock handles and a newly designed full gasket door plate provides a water tight door seal. *Crown Rheostat & Supply Co.*

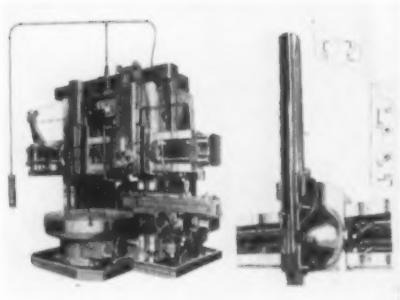
**For more data insert No. 9 on postcard, p. 35.**




## Hydraulic table handles bulky workpieces

For easy accurate bandsawing of heavy or bulky workpieces such as large die blocks, castings or forgings a new heavy duty 36-in. stroke hydraulic table is available as an accessory table for standard DoAll machines. It can be used for production sawing, cut-off work and for slicing intricate ferrous or nonferrous castings for inspection, as the workpiece is cut automatically with a smooth precision finish. The table shown has a 40x48-in. top and a carriage bed 87x36 in. that will support a 3000-lb load. The bed connects to the machine frame and is supported by fabricated steel legs with leveling screws. The hydraulic system consists of a 5-gal reservoir and a 2 gpm gear-type hydraulic pump driven by a ¾ hp motor. Controls are mounted on a panel mounted on the carriage bed for table feed up to 18 ipm. *DoAll Co.*

**For more data insert No. 10 on postcard, p. 35.**



## Vertical boring and turning mills

New advanced built-in design features of 54 in., 64 in., 6 ft standard and 6 ft heavy mills add to machining accuracy and overall work handling capacity. These structural features include: Nonmetallic bearings for ram and saddle; independent traverse motors for rail and side heads; new 16 feed gear box; table anti-friction thrust and load bearings; two arrangements of mechanical change gear drives; and three electrical arrangements for single shift drives. *Giddings & Lewis Machine Tool Co.*

**For more data insert No. 11 on postcard, p. 35.**

***Turn to Page 126***

# IRON AGE *salutes*

A HEALTHY curiosity, a yen for figures and an ability to analyze what you find, produces an outstanding personality. Such a fellow is David F. Austin, executive vice-president-commercial, U. S. Steel Co.

Dave is a career man with U. S. Steel. He started as an office boy. His memory is terrific and everything he learned from the beginning he uses today.

He is an introvert by nature and an extrovert by acquisition; he has the ability to combine salesmanship with the finer points of detailed analyses. In addition to this he has a vivid imagination.

Maybe that's one reason why this week he received the 1951 Parlin Memorial Award for his outstanding contribution to the field of marketing.

Dave loves the steel industry; he is a perfectionist where it is concerned. He defends it with eloquence against all attacks from without; is critical of it within when he thinks more progress should be made.

His one big idea, which he pounds at night and day—we must have salesmen to sell our steel and our ideas. Now is the time to train salesmen, Dave thinks. He also feels and acts on the basis that salesmen should be market conscious at all times—even if it means burning the midnight oil on market reports.

He would rather choose between right and wrong than choose the lesser of two evils. To him honesty is not only the best policy—it is the only one.

ROGER W. BERRETT, appointed senior assistant purchasing agent of American Steel & Wire Co., Cleveland.

W. P. GETTY, appointed assistant to vice-president-operations of the Jones & Laughlin Steel Corp., Pittsburgh.

J. J. ROZNER, elected vice-president in charge of operations of the Aetna Ball & Roller Bearing Co., Chicago.

ROBERT C. PALMER, elected vice-president of the Ingalls Iron Works Co., Birmingham.

# IRON AGE *introduces*

***Continued***

**Michael Curto,** appointed assistant manager of sales in the Pittsburgh district sales office of U. S. STEEL CO. **Homer C. Lackey** was appointed manager of commercial forgings sales. **James H. Duff** was named as assistant manager of sales, New York district.

**Lloyd G. Depner,** appointed manager of sales personnel and organization of AMERICAN STEEL & WIRE CO., Cleveland.

**F. R. Dickerson,** promoted to general manager of the pump division of the GEORGE D. ROPER CORP., Rockford, Ill.

**Charles W. Bryan, Jr.,** and **Mark W. Cresap, Jr.,** elected to the board of directors of GENERAL STEEL CASTINGS CORP., Granite City, Ill.

**James Hatch,** appointed production manager of both the ROCK ISLAND BRIDGE & IRON WORKS and the DAVENPORT STEEL CO., Rock Island, Ill. **Charles Pahl** becomes superintendent of the Works and **Carl Rexine** assumes the duties of chief engineer of both the Works and the Davenport Steel Co. **R. R. Crouch** retired as superintendent after 38 years at the plant.

**Lawrence E. Mock,** elected treasurer of HARBISON-WALKER REFRACTORIES CO., Pittsburgh, succeeding **W. Forman Bickel,** who has resigned after serving the company in this capacity for 24 years.

**Joseph L. Prus,** appointed assistant manager of employee relations of AMERICAN BRAKE SHOE CO., New York.

**Allen Hurt,** named sales manager, Cleveland division of SOLAR STEEL CORP.

**W. R. Eby,** named manager of the Pacific district of YORK CORP., York, Pa., succeeding **Rodney F. Lauer,** who was recently elevated to vice-president in charge of engineering and research.

**Alan Cameron,** named manager of the newly created foundry division of ROSÁN, INC., South Gage, Calif.

**George C. Simon, Jr.,** appointed plant superintendent of the WILSON SPRING CO., INC., Newark, N. J.

**Albert B. Diss,** appointed manager of manufacturing operations of the WATSON-STILLMAN CO., Roselle, N. J.

**Fred H. Haggerson,** elected chairman of the board of directors of UNION CARBIDE & CARBON CORP., New York. Mr. Haggerson has been president of the organization since 1944.

**Warren A. Lacke,** appointed general manager of industrial relations of the CONTINENTAL CAN CO., New York, taking over the duties of **J. E. Niederhauser,** formerly vice-president in charge of industrial relations, who has retired.

**Edmund F. Ball,** elected to the board of directors of BORG-WARNER CORP., Chicago.

**Clayton E. Scholes,** appointed assistant to the president of OSCO STEEL CO., Cleveland.

**Robert D. Black,** elected vice-president of the BLACK & DECKER MFG. CO., Towson, Md. Other officers elected: **Glen H. Tresler,** vice-president in charge of sales; **Alonzo G. Decker, Jr.,** vice-president in charge of manufacturing; **Frank J. Nagell,** treasurer, and **Thomas I. Burbage,** secretary.

**Howard Raymond** and **John E. Charters,** appointed as assistant purchasing agents for the DOW CHEMICAL CO., Midland, Mich.

**Marshall N. Terry,** appointed director of advertising of the TRAILMOBILE CO., Cincinnati.

**Robert W. Suman,** named chief engineer of the Philadelphia plant of LINK-BELT CO.

**H. J. Krause,** appointed Eastern sales representative, Beardsley & Piper Division, PETTIBONE MULLIKEN CORP., Chicago. **Harold Lind** has been transferred and appointed district sales representative in the Midwest territory to succeed the late R. L. Hannan.

**Andrew M. Kennedy, Jr.,** appointed director of purchasing in charge of steel procurement for the WESTINGHOUSE ELECTRIC CORP., Pittsburgh.

**Harold L. Zimmer,** appointed advertising manager of the CURTIS MFG. CO., St. Louis.

*Typical thermometer and barometer desk set made by Standard Thermometer, Inc., 952 Dorchester Ave., Boston 25, Mass. Standard's instruments are not only sold to government, industry and over the counter, but many are also imprinted with company names and become valued gifts to top executives of important customers.*

*Punching spoke holes in brass cups which have been drawn, cut, and passed by Inspection.*

## TO MEASURE TIME AND WEATHER

# BEGIN WITH THE BRASS

● Standard Thermometer, Inc., is a well-known maker of thermometers, barometers, hygrometers, and clocks, for outdoor, desk, and industrial use. Naturally, brass is an important item in these instruments, being used for cases because of its golden beauty and for operating parts because of its reliable physical characteristics, including corrosion resistance.

Fabrication methods include stamping and drawing of cases and bezels. The company is an old and experienced one, dating back to 1885, and has been a Revere customer since that time. Recently it began to experience certain fabrication difficulties. When Revere heard about them, the Technical Advisory Service was asked to look into the matter. The brass being used was analyzed, and factory tools and methods studied. An elaborate 17-page report was prepared, including photographs of micro-sections to show the grain structure of various samples, and detailed recommendations were made. In general, it was found that such things as puckers, orange peel, and flare were due to a combination of factors, including composition of the brass, its temper, the dies, and the lubricant used on them. Standards were set up for metal specification and though Revere does not design dies, suggestions were made for the consideration of the designers.

After digesting the report and putting the recommendations to the proof, Standard wrote: "We are extremely grateful for this information, and it represents a splendid job and one of great value to us."

Perhaps Revere can work with you too on such matters as specification, fabrication, ideas to save precious metal. Our collaboration is freely given.

**REVERE** 150th YEAR OF SERVICE TO AMERICA

**COPPER AND BRASS INCORPORATED**

*Founded by Paul Revere in 1801*

230 Park Avenue, New York 17, N. Y.

• • •

*Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere*

SEE "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY

# *on the assembly line*

*automotive news and opinions*

**K-F to make stampings for Fisher Body at Willow Run . . . More alloy steel substitutions coming . . . Diesels move ahead**

*by Walter G. Patton*

**Both Benefit** — K-F will begin soon to make stampings for Fisher Body at Willow Run. It's a good deal for both sides. Fisher gets more steel — to be furnished by K-F. The latter gets round-the-clock operation for its big stamping plant. K-F is currently idle but operations are expected to be resumed within a week or two—if the car market picks up.

**Buick Jet Parts**—Reports persist that Fisher Body-Flint will fabricate sheet metal parts for the new Buick jet engine. Oldsmobile will be the subcontractor for forgings, it is reported.

**Statement Soon**—An announcement is expected soon on the so-called "25-mile plant" to be built and operated by Chrysler Corp. This jet engine plant will be located within 25 miles of Detroit City Hall. The Chrysler-Trenton engine plant will not be involved in the building of jet engines, according to recent information.

**Immediate Delivery**—Plymouth dealers, advertising as a group on TV, are offering immediate delivery in Detroit. A Hudson dealer is offering free "courtesy" transportation during the DSR strike.

**Magnesium Finish**—Army Ordnance has announced a new finish for magnesium and magnesium alloys. Named HAE after its discoverer, H. A. E. Evangelides, the new finish offers excellent corrosion resistance, high melting point, good dielectric strength and hardness. It has a normally brown color of varying shades and is an excellent paint base.

**Conserving Alloys** — Organized efforts to conserve precious alloy required as a hardening agent in steel are mounting rapidly. In addition to motor cars, trucks, aircraft and earth-moving equipment, the Iron and Steel Committee of SAE is currently working on Ordnance specifications.

The SAE group has already reviewed current specifications and recommended a number of lighter steel sections containing a smaller percentage of alloy for the Army jeep. The committee is now at work on trucks required in large numbers by Ordnance. These include 6 x 6's and 4 x 4's in the range of 2½ to 5 tons.

**Save Alloy in Oil**—The Detroit SAE group has also been asked to make recommendations which will result in substantial saving of alloy for the oil industry. Next in line are the machine tool builders who are finding it increasingly difficult to get alloy steels needed to build machine tools.

Like the automobile, aircraft industries and Army Ordnance, machine tool builders are expected eventually to be using a substantial quantity of alloy steels to which boron has been added as an intensifier.

**Boron Is Coming**—The amount of alloy used in automobile steels has been reduced substantially in recent months. Alloy steels containing 0.20 to 0.30 pct molybdenum have practically disappeared.

One of the most popular steels today is the SAE 8100, containing 0.08 to 0.15 pct molybdenum. In the near future, boron is expected to replace a substantial amount of alloys used today.

**Harping on the Subject**—Interest in boron steel is evidenced by the fact that when the SAE Committee meets in Detroit it invariably attracts a large group of metallurgists from all over the country.

At a recent meetings, attendance was 75. The number of members serving officially on the committee is 15. Boron steels was the subject of the meeting.

**Salute to Technology**—Detroit engineers and metallurgists will get a long overdue salute during the week of July 27 when the city celebrates its 250th birthday anniversary. At the Rackham Building, 38 technical societies will have attractive displays, including pictures and text describing the

# assembly line

*Continued*

specific functions of each technical organization.

Pictorial displays will be placed in the dining room of the Rackham Building. In addition, the public will be entertained by GM's famed Science Exhibit. Many industrial plants throughout the city will hold special open house. This will be the city's first gala celebration since the Automobile Golden Jubilee in 1946.

**"Underestimate Our Value"**—K. T. Keller, Chrysler board chairman, expressed what is in the mind of many Detroiters last week when he told Chrysler stockholders:

"Material shortages and limitations on the quantities that may be used in civilian manufacture can be expected to continue and to become more severe as the defense program gathers momentum. The prospective decrease in production of motor vehicles raises the question of whether the indispensable part motor transport performs in sustaining a vigorous defense effort has been accurately evaluated by the government authorities."

**Shell Machining Kit**—Carboloy Co., Detroit, has accumulated all currently available data on the machining of shells and is compiling this information in a complete kit for the use of manufacturers who either have shell production contracts or who may be bidding on such contracts. The information is restricted.

The kit includes feeds and speeds, tool application and grinding, tool design and brazing. Tool layouts and methods of insuring maximum tool conservation are included. Supplementary data describing recent practices will be furnished to all holders of registered kits.

**The Doughty Diesels**—Astounding is the only word to describe the progress of Diesels on American railroads. Latest reports show 5201 freight and passenger car steam locomotives have been retired from service during the past 10 years. Diesels numbering 17 pct of total freight locomotives are performing 44 pct of the work.

**THE BULL OF THE WOODS** — **By J. R. Williams**

BUT, MARTHA, I DON'T THINK THAT'LL WORK ANY MORE! THERE'S TWO BARS BETWEEN HERE AND TH' GROCERY NOW-- I'LL TRY TO FIGGER OUT SOMETHIN' ELSE!
IN TH' DAYS WHEN TH' SHOP WAS SMALL AN' FRIENDLY, A LITTLE GROCERY USED TO BE THIS SIDE OF TH' SALOON AN' TH' BULL USED TO TAKE GROCERY ORDERS-- REMEMBER?
OH, MY WIFE AN' HIM WORKED IT ON ME EVERY PAYDAY--I'D GET TO TH' BAR WITH TWO ARMS O' GROCERIES AN' ONE DOLLAR, AN' TH' SALOON KEEPER HAD TO DELIVER GROCERIES OFTEN!
5-18
J.R.WILLIAMS
HEROES ARE MADE-NOT BORN
T. M. REG. U. S. PAT. OFF. COPR. 1951 BY NEA SERVICE, INC.

**Reports show the typical steam locomotive in 1950 hauled 2400 tons 15 miles in 1 hr. This compares with 3000 tons hauled 20 miles in 1 hr by a Diesel. Five men are required to repair and service a steam locomotive compared with one maintenance man for a Diesel.**

**Steel for Suppliers**—Suppliers of the automobile industry who normally depend on warehouses as a source of steel are having a rough time. Latest information indicates that warehouses all over the country are down to about 30 to 40 pct on stocks held during September 1949.

In the midwest area some warehouses report DO's are accounting for 75 pct of their stainless and alloy shipments and one-third of carbon steel shipments.

**Tough Decision**—The question of 1952 models is not yet clear. Actual decisions about putting the new model cars into production will have to wait. Such decisions will be difficult, particularly where the new models involve extensive body changes.

The present restriction on the selling price of cars will be a major factor to be considered in arriving at a final decision.

**Accepted** — Automation has caught on in a big way in Detroit. It has now reached the point where small businesses are being contacted by engineers who promise big savings resulting from improved materials handling and other forms of automation. A small version of the Iron Hand for removing stampings from dies will shortly be made available to the trade.

**Peening**—Applications for shot peening are expanding rapidly in Detroit. Chrysler is peening both gears and fillets for the crankshaft of its new V-8 engines. Tanks to be built under the new tank program will have peened gears and torsion bars. Peening helps resist failure in service as a result of fatigue. Both cast and cut wire shot are being used to peen the parts.

## This casting eliminates copper plating and saves production costs

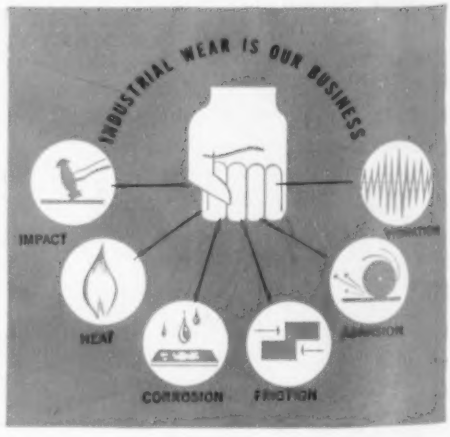
The business end of this super meat chopper will produce up to 20 pounds of meat per minute. The housing that guides the meat is a casting made of Chemalloy N-2 (Ni-Resist) which is resistant to wear and corrosion from meat juices and prevents iron contamination.

The alloy eliminates the necessity of copper plating before the final chrome finish, saving both scarce and costly material and production time.

This gravity feed chopper offers 50% greater speed and easier and cleaner work without mashing or heating the meat. It is widely used in hospitals, restaurants, hotels and food stores. Our Electro-Alloys Division filled the needs of the Toledo Scale Company for an exceptional casting.

This is just one of the many cast parts ideally suited to Brake Shoe Chemalloy. The difficult casting is held to close tolerances, is remarkably free from porosity and imperfections; and is of a uniform and closely grained structure.

Electro-Alloys invites your inquiries concerning quantity high alloy castings. Write Department F for brochure T-155 on heat and corrosion resistant alloys.




AMERICAN Brake Shoe COMPANY

230 PARK AVE., NEW YORK 17, N. Y.

**10 Divisions of American Brake Shoe Co. produce wear-resisting parts in 55 American and Canadian plants.**

AMERICAN BRAKEBLOK DIVISION • AMERICAN FORGE DIVISION • AMERICAN MANGANESE STEEL DIVISION
BRAKE SHOE AND CASTINGS DIVISION • ELECTRO-ALLOYS DIVISION • ENGINEERED CASTINGS DIVISION
KELLOGG DIVISION • NATIONAL BEARING DIVISION • RAMAPO AJAX DIVISION • SOUTHERN WHEEL DIVISION

Copyright 1951, American Brake Shoe Company

# west coast progress report

*digest of far west industrial activity*

*by R.T.Reinhardt*

**Steel vs Smog**—About 85,000 tons of badly needed first class iron and steel scrap is lying around auto wreckers' yards in 10 countries south of San Luis Obispo. Sixty thousand of these jalopies have been cleared by the state so far as ownership goes and the rest could be cleared within 90 days.

To get this scrap into steelmaking furnaces won't be easy. Wreckers cling to the heaps in the hope of selling parts and Los Angeles County Air Pollution Control District regulations prohibit the burning essential to cleaning.

Wreckers would be willing to dispose of many older cars if burning restrictions were eased. Scrap buyers are attempting to have the smog control board permit such burning for a 24-hr period once a week. Those in the know say there is little chance such a variance will be allowed unless the Federal government demands it to relieve the scrap shortage.

**Beth Fights Back**—Bethlehem Pacific Coast Steel Corp. has gone to Superior Court to prevent the L. A. County Air Pollution Control District from forcing it to shut down three 50-ton openhearths.

The company wants to continue to operate them until its newest 75-ton electric furnace is producing at the end of this year. Bethlehem Pacific claims it would lose about 6000 net tons of steel per month if the openhearths went down now.

**Iron Ore Moving Out** — First major shipment of iron ore for Japan through San Francisco Bay began last week with arrival of several carloads of high grade ore at the Port Richmond Terminal as the forerunner of 700,000 tons.

Standard Slag Co. of Gabbs, Nev., is supplying the first 200,000 tons from a deposit estimated to contain as much as 1 million tons. Initial shipments are reported to run between 62.5 and 65 pct Fe with sulfur from .1 to .35 pct by Bradley & Ekstrom of San Francisco. It is handling the shipments for the Yawata Iron & Steel Co.; Fupi Iron & Steel Co.; and the Nippon Steel Tube Co. of Japan.

**Seek 2 Million Tons More**—Brokers here and in Japan are in further negotiations for ore tonnages totalling nearly 2 million. Feelers are going into Canada and Mexico in an attempt to supply ore Japan once received from the Far East.

No prices are being revealed on latest shipments, but in the past $10 a ton delivered to dockside have prevailed for Utah ores. These costs plus the freight haul account in part for the prices of Japanese steel which have been running 50 to 60 pct higher than domestic prices.

**No Help for Foundries**—All of the iron produced in the 600-ton capacity blast furnace leased last week by Geneva Steel Co. from Kaiser-Frazer Parts Co. is destined for the openhearths of Geneva.

Increasing scarcity of purchasable scrap and the necessity for taking one of Geneva's blast furnace out of production for relining prompted the 3-year lease with option to buy arrangement.

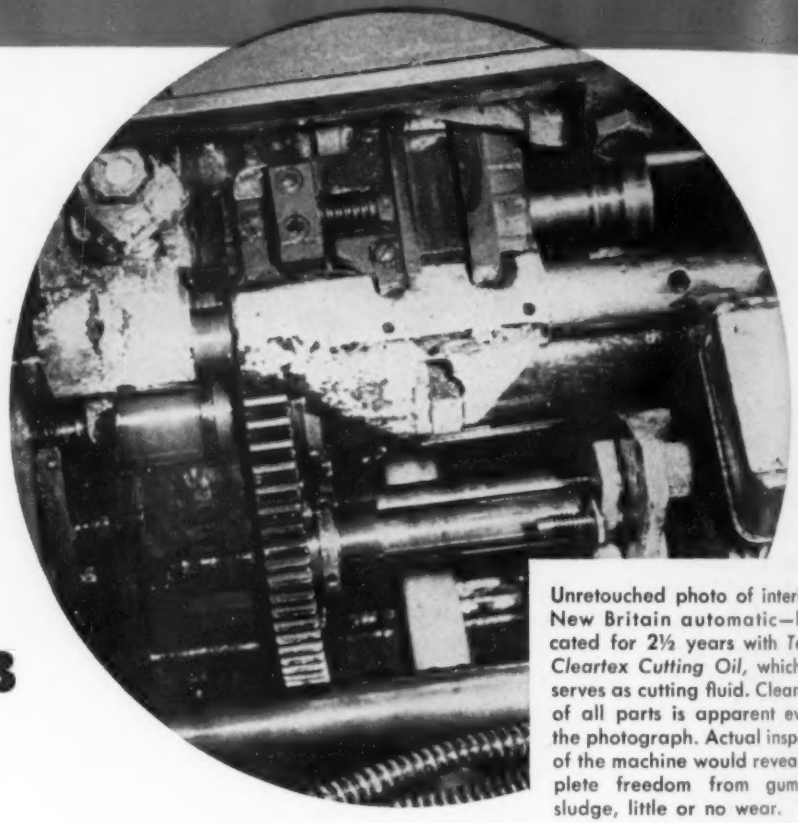
**Little Man Hurt**—Metal working shops employing up to 25 persons in the San Francisco Bay Area are operating at less than 50 pct of capacity and many face shutdown unless they can obtain defense subcontracts. This is one of the findings of the S. F. Chamber of Commerce Industrial Department.

The situation is blamed on a "twilight zone of civilian-defense production confusion" caused by material shortages; inability to plan for the future because of "uncertainties"; difficulty in holding skilled labor; and insufficient time or information to prepare defense work bids.

**Specialty Shops Hit** — Partial idleness in all types of shops was found. Small specialty shops are hardest hit. Metal plants employmore than 25 making iron and steel castings; brass, bronze and aluminum fabricators; and machine shops are at 100 pct capacity and there are no idle automatic screw machines in the Bay area.

# THIS DUAL PURPOSE OIL STEPS UP PRODUCTION

## New England manufacturer* also gets longer tool life, cleaner operation with TEXACO CLEARTEX CUTTING OIL B



Unretouched photo of interior of New Britain automatic—lubricated for 2½ years with *Texaco Cleartex Cutting Oil*, which also serves as cutting fluid. Cleanliness of all parts is apparent even in the photograph. Actual inspection of the machine would reveal complete freedom from gum and sludge, little or no wear.

For 2½ years this plant has been using one oil—*Texaco Cleartex Cutting Oil B*—as both cutting fluid and machine lubricant in their New Britain automatics. Results are notably better than those obtained when separate cutting and lube oils were used. Production is up; costs are down.

Machines are in regular production, 16 hours a day, on No. 430 stainless steel. Setup includes drilling, forming and cut-off operations. With *Texaco Cleartex Cutting Oil B,* drill life has been stepped up to one million pieces, and a circular form tool is good for two million pieces.

Another impressive fact is the exceptional cleanliness of the interior of the lubricating side after 2½ years' use (see illustration) . . . and, of course, there has been no wastage due to contamination of the coolant by the lube oil—as when two oils were used.

Whatever your metal cutting operations, there are Texaco Cutting, Grinding and Soluble Oils to help you do them better, faster, and at lower cost. A Texaco Lubrication Engineer will gladly work with you. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

**Name of this Texaco user on request*

TEXACO

**TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING**

**TUNE IN . . .** TEXACO STAR THEATER starring MILTON BERLE on television every Tuesday night. See newspaper for time and station.

# *the federal view*

*this week in washington*

*by Eugene J. Hardy*

**Additional Steel Certificates**—Applications for certificates of necessity for steel expansion are again beginning to flow through the government mill, but the rate of flow will be very small. The informal freeze on granting of steel certificates is being lifted primarily because the Defense Production Administration is about to arrive at what is described as a "goal" for steel expansion.

Major difficulty facing DPA has been the fact that the still pending applications totalling substantially more than 10 million tons additional capacity reveal a striking imbalance between ingot and finishing capacity.

**Raw Materials**—Adequate raw materials just aren't available for some of the projected increases. So, it's better than an even bet that the major portion of the pending applications will not be approved.

This more realistic approach to the granting of certificates is largely the result of the industry's insistence on the need for accurate studies as to when and where the needed materials might be available so that there would be a yardstick for authorizing construction of additional facilities. Sparkplug of this effort has been R. J. Wysor, who has come into NPA.

**Needed for Defense** — Strong support for keeping the giant lending agency in business came from Defense Mobilizer Charles E. Wilson on Capitol Hill during the days when RFC hovered between life and death.

Mr. Wilson said an abolition of RFC would be "extremely harmful to the defense mobilization program." A number of congressmen switched their voting plans after hearing Wilson's plea.

**Danger Ahead?**—There are increasing signs that the same thing that wrecked the original MRO is creeping in to threaten the CMP. That factor is over-extension. NPA officials want to keep CMP open end.

And last week, Commerce Secretary Sawyer told a Senate committee that "at present, an extension of CMP to consumer durables and other civilian goods is not contemplated."

**On the Bandwagon**—But industries are already flocking to NPA, asking to be included under specific allocations. A few—for example, manufacturers of hand tools—have been given such assurance. Each admission to benefits of CMP will bring louder cries from others. And each such inclusion on the list for allocation will hack away at the dwindling supply of free steel.

On this basis, there is a growing belief on the part of some here that in the end the open end CMP will have to be abandoned in favor of the wartime basis of complete control.

**New Salary Board**—First steps leading toward a nationwide salary freeze are due to be taken soon with appointment of a 3-man Salary Stabilization Board.

The new board will operate independently of the 18-man Wage Stabilization Board that has been characterized by a short and stormy career.

Economic Stabilizer Eric Johnston is planning to give his new SSB complete control over the salary limitations on all "bona fide executive, administrative, professional, and outside salesmen" employees, as defined in the Fair Labor Standards Act.

**Who is Included** — "Executive and administrative employees" includes management and some supervisory employees and their staff personnel. "Professional employees" are those with full professional status, such as engineers and accountants. "Outside salesmen" are those employed away from the employer's place of business and who work for either a salary or commission.

Authority of the new board extends to the salaries of employees who are exempt from the premium-pay provisions of the wage-hour law. Pay of employees who receive time-and-a-half after 40 hours will remain under WSB.

Dr. George Taylor, WSB chairman, will serve as nonvoting ex-officio member of SSB.

## Here is a picture you helped us to paint

This month of May marks an important milestone in our relationship with you. It's the 50th birthday of our Indiana Harbor works.

Naturally we're a little proud of the growth of "The Harbor" from a sandy wasteland to an efficient steel-making facility. But, more than that, we're grateful to you . . . our customers, suppliers and friends . . . for making the growth possible.

So, without the usual anniversary platitudes, we say sincerely, "Thanks."

(By the way . . . the picture on the right is rapidly becoming obsolete as we further expand our ingot producing facilities by another 20%).

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THE IRON AGE
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FEATURE ARTICLES

**Because American zirconium production all goes to AEC, the English have been the first to supply the metal to industry. A modified Kroll practice for sponge production is used. Commercial uses are growing. Deep drawing of Kroll zirconium is one practical application.**

# COMMERCIAL USES of zirconium developing

**By G. L. Miller**
*Research Manager Murex Ltd.*
*Rainham Essex England*

Current world production of ductile zirconium as far as is known is confined to the U. S. Bureau of Mines, Oregon, Foote Mineral Co., Philadelphia, and Murex Limited, Rainham, England. Practically all of the American production is by the Atomic Energy Commission so that the British have been the first to offer the metal to industry in quantities sufficient to determine its commercial possibilities.

There has been some production of zirconium metal powder in Germany by the reduction of potassium zirconium fluoride with sodium but no one has claimed the production of ductile metal from this powder, nor from that produced by the calcium reduction of zirconium dioxide.

The Kroll process for producing ductile zirconium has been developed rapidly from a laboratory unit to a full-scale production plant and has completely out-stripped its rival the Iodide or van Arkel process, which was the first to yield ductile zirconium on a commercial scale. The two processes are quite different in every respect except that a halide is an intermediate in the reduction process.

The van Arkel process depends for its operation on the thermal decomposition of zirconium tetraiodide to the elements zirconium and iodine. Originally the tetraiodide was produced and decomposed in the same glass vacuum vessel, the tetraiodide being formed by the interaction of technical grade metal and iodine vapor in the cooler parts of the vessel while the iodide so formed was decomposed by contacting a zirconium filament heated to a high temperature by its own resistance to the passage of current. The elemental zirconium built up in the form of large crystals on the filament until a rod was formed which could be removed and worked.

### Higher tonnages possible

Later researches indicate that much larger scale operations may become possible but up till a year or so ago, it had not been found possible to overcome the technical difficulties. There is little doubt that on paper the van Arkel process is to be preferred to the Kroll process, particularly if the tetraiodide can be made from an intermediate such as carbide instead of metal.

The Kroll process may be described briefly as the reduction of zirconium tetrachloride vapor

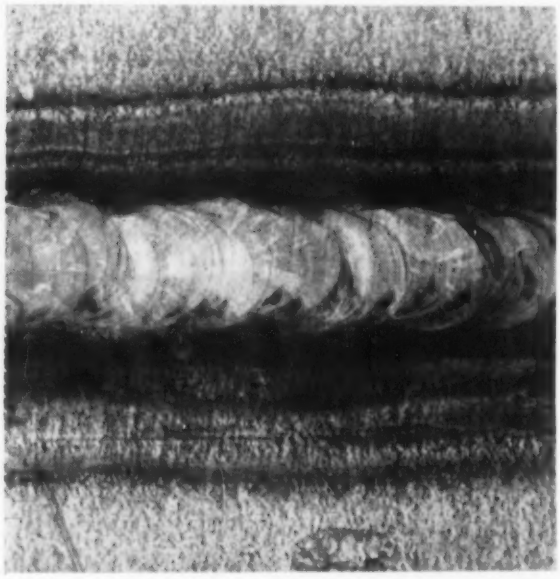
ZIRCONIUM INGOTS made by Murex Ltd.

## Commercial uses of Zr (continued)

with molten magnesium. The tetrachloride may be produced by chlorinating a mixture of a zirconium mineral such as zircon (zirconium silicate) and carbon. The chlorination takes place at a lower temperature if the zircon is first converted to zirconium-carbonitride by heating it at a high temperature with carbon. Zirconium tetrachloride is extremely hygroscopic and hydroxide is produced by the presence of the absorbed moisture.

One of the features of the Kroll process is a technique specially designed to avoid the formation of hydroxide which would result in the formation of excessive amounts of oxide in the final metal. The tetrachloride produced by the chlorination of the zircon is converted from a light fluffy powder into a dense block by subliming the chloride in a hydrogen atmosphere and collecting on a coil condenser at a temperature slightly lower than the sublimation temperature, at the same time iron and silicon present in the original chloride are removed.

ZIRCONIUM IS WELDED under an argon atmosphere.



The dense block of chloride is much less liable to absorb moisture from the atmosphere and it can be quickly and easily removed from the densification vessel and placed in the reduction unit which is already charged with magnesium.

The vessel is sealed and evacuated and filled with helium or argon, and after raising the magnesium to a temperature above the melting point of magnesium chloride, the zirconium tetrachloride is sublimed at a controlled rate so that its vapor is reduced by the molten magnesium without the evolution of excessive heat. When the reaction is complete, the crucible containing the zirconium and magnesium chloride is transferred to another vessel and heated in vacuum to separate the salt from the metal. Finally, the zirconium in the form of a sponge-like mass is melted to solid ingots using carbon as the crucible material.

### MECHANICAL PROPERTIES OF ZIRCONIUM

| Material | U.T.S., Tons per sq. in. | Limit of Proportionality, Tons per sq. in. | Elongation, pct | Reduction in Area, pct |
|---|---|---|---|---|
| Sheathed zirconium ingot forged and rolled at 850°C to 0.08 in. Cold rolled to 0.02 in. | 46.0<br>46.3 | 41.3<br>42.5 | 6<br>7 | 16.5<br>16.5 |
| After annealing in air for a a few seconds at about 650°C. | 34.9<br>31.8 | 32.4<br>27.9 | 21<br>24 | 34.5<br>47.5 |
| Bare zirconium forged and rolled at 650°C to 0.08 in. Cold rolled to 0.03 in. | 43.7<br>43.7 | 41.8<br>40.5 | 5<br>7 | 20.5<br>19.5 |
| After annealing in air for a few seconds at about 650°C. | 31.6<br>29.8 | 28.3<br>26.5 | 26<br>24 | 53.0<br>54.5 |
| Bare zirconium forged and rolled at 750°C to 0.06 in. and annealed at 700°C. | 31.4<br>31.2 | 24.5<br>24.6 | 14<br>16 | 30.8<br>33.6 |

The plant at Rainham is designed on the lines of the unit at Oregon, but a number of changes in design have been made and it is considered these alterations have helped to produce a plant which can be operated without much difficulty and with normally intelligent operators in place of the university graduates employed at the Bureau. The plant is well instrumented and includes vacuum recorders in addition to the normal vacuum indicators. In every instance, the furnaces are over-powered and this has aided smooth operation, and this applies in particular in the case of the salts separator unit where the magnesium chloride and excess magnesium are removed by heating in vacuum.

A number of batches of zirconium sponge have been produced with little incident except in one case when the sponge was exposed to the atmosphere before thoroughly conditioning, and the metal ignited. The sponge has been melted to ingot with less trouble than that reported by the Bureau who state that the molten charge sometimes boils and is partially expelled from

*Zirconium analysis*

| | Pct |
|---|---|
| *Iron* | *0.04* |
| *Carbon* | *0.08* |
| *Oxygen* | *0.08* |
| *Nitrogen* | *0.002* |
| *Magnesium* | *0.002* |

Silicon figures are usually in the 0.005 pct region

the crucible. This has never occurred at the Murex plant and, as very little volatiles are collected on the condenser when melting, it is assumed there is less chloride and also possibly less gas in the Murex sponge.

The split tube graphite resistor-type furnace which is used for melting has been found to be most successful and is easily operated once the setup is adjusted. Long life of the resistor tubes and even the melting crucible is a feature which helps to keep down melting costs. The use of carbon split molds for the casting ingots also helps. The only difficulty encountered in casting is caused by the use of a relatively cool mold which yields ingots with rather rough surfaces.

The above analysis shown in the box was made on a recent sample of zirconium sheet and while it would not be accepted as a specification, it does indicate the high purity that is obtainable by the Kroll process.

## Sheath rolling methods used

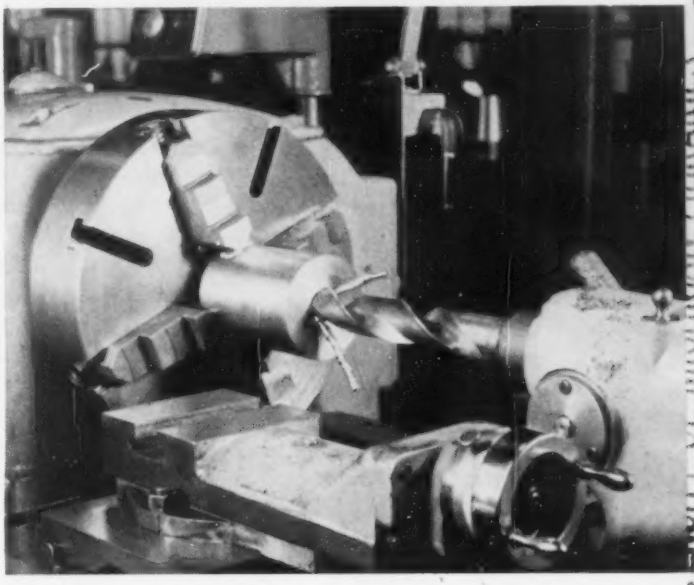
The production of sheet from the ingot metal has caused no difficulty. The zirconium ingots are machined to smooth bars and inserted in tight fitting clean seamless tube and the ends plugged with metal blocks which are welded in place producing a gas-tight sheath.

The assembly is placed in an open electric muffle at 850°C, and when the mass is thoroughly soaked, it is forged under the hammer until a flat slab is produced. It is possible to do the whole operation without reheating.

The slab is reheated to 850°C and passed through the rolls making a 20 to 30 pct reduction, the slab being reheated between passes. The reductions are continued at 20 to 30 pct until the "sandwich" has attained the thickness which experience indicates is correct. The ends and sides are guillotined and the "sandwich" dropped on the floor to loosen it, when the zirconium is readily detached. It has been found possible to cold roll the zirconium sheet from 0.2 to 0.01 in. without annealing, using 20 pct reduction. Rolling can be continued after annealing and 0.05 in. sheet has been produced.

After removing the steel sheath, the zirconium is pickled to remove traces of oxide before proceeding to cold roll. Experience has shown that the best results are obtained by using equal volumes of 10 pct (by volume) nitric acid and 40 pct hydrofluoric acid. The stains which appear are easily wiped off, whereas if the lead nitrate plus nitric acid plus hydrofluoric acid bath proposed by other workers is used, stains are formed which can only be removed by abrasives.

Sometimes dull gray stains are visible after the pickling and it is considered these are iron stains; these can be removed by hydrochloric acid. The product is a bright silvery sheet which is rather rough but which becomes smooth and polished by the final cold rolling.



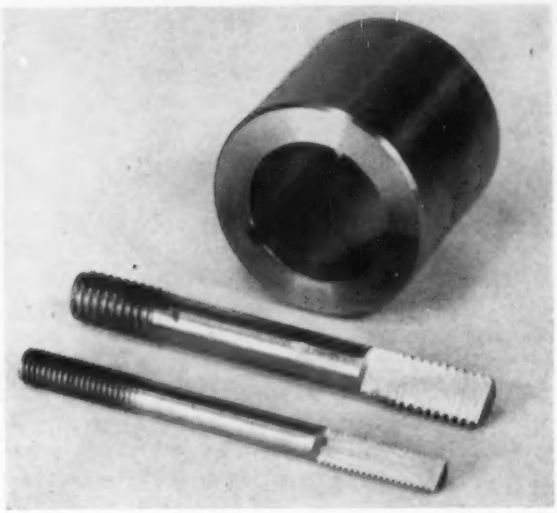
DRILLING ZIRCONIUM ingot with a 1½-in. drill on an 18-in. lathe.

The zirconium is sheathed because the hot metal is very reactive towards oxygen and nitrogen but despite this some work has been done on hot working unsheathed metal, and the results have been good. In this case, the working temperature is 650°C in order to keep the oxidation down to reasonable limits. The metal works readily at this temperature and although oxidation takes place, it causes no difficulty. The operations are very similar to working with the sheathed metal but the pickling operation must be more intensive to remove the rather thick oxide skin. After cold rolling the cleaned metal, it differs little in appearance to the product from sheathed working.

Tensile strength measurements of zirconium sheet produced by forging and rolling unsheathed

*Recommended cutting angles*

| Angle | General Turning |
|---|---|
| *Approach angle* | *30°* |
| *Side rake angle* | *25°* |
| *Back rake angle* | *0°* |
| *Plain relief angle* | *15°* |
| *Side relief angle* | *8°* |
| *End relief angle* | *8°* |
| *Nose radius* | *0.05 in.* |



MACHINED PARTS include studs with rolled threads.

Commercial uses of Zr (continued)

metal are very similar to sheathed even when the rolling has been done on metal heated to 750°C. Comparison of mechanical properties appears in the table on page 84.

It is impossible to state at this stage how other properties of zirconium are effected by working the metal in air and until more about this subject is known, no production of sheet by the unsheathed process will be made.

Some rod and wire have been produced by working in the unsheathed condition. The ingot is heated to 650°C and forged to a hexagonal shape about 1 in. thick and reheated to 650°C before swaging. This is continued, heating to 650°C between passes until the rod is about 0.25 in., when the temperature may be dropped to about 450°C and swaging continued to 0.10 in. It may be necessary to heat once or twice during these operations to 650°C.

### Oxidized surface prevents galling

Zirconium behaves like tantalum when drawn and becomes welded to the die walls but it is possible to overcome this difficulty by oxidizing the surface by heating in air for a short period at about 650°C. This oxidized condition has already been obtained by the heat treatment during the swaging operations. It is sometimes desirable to clean most of the oxide skin of the bar after the major reductions, and before continuing to swage to the final size.

Drawing is commenced at 0.10 in. using carbide dies with beeswax as a lubricant. About 16 pct reductions are made down to 0.01 in. with two short anneals at 650°C at 0.06 and 0.02 in.

The final wire is dull because of the oxidation and it is difficult to obtain a satisfactory bright finish. Pickling gives a rough surface and abrasion is useless for fine wire for obvious reasons. It is possible, by heating at a high temperature in vacuum, to disperse the oxide skin inwards and so present a clean, bright surface, but this is most unsatisfactory as the metal is embrittled.

An alternative method for working zirconium ingot to rod and wire is to sheath with copper but there is little advantage to be gained, particularly as the final metal, after removing the copper by attacking with concentrated nitric acid, is dull and does not have a bright finish.

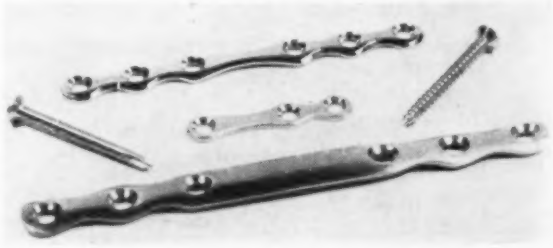
In all the fabrication mentioned so far except drawing, the metal has been worked at 650° or 750°C, but considerable cold-working is possible if the metal is fully annealed by heating above its recrystallization point. The recrystallization of zirconium occurs at about 700°C but if the metal is heated to this temperature in air, it hardens because of oxidation. It is necessary, therefore, to exclude air during the annealing operation if the fullest softening is desired. Air may be excluded by using an inert gas such as argon for the furnace atmosphere or the furnace chamber may be completely evacuated. If argon is used, it is necessary to purify it by removing the small amount (about 0.2 pct) of nitrogen present in the commercial gas. The complete removal of the nitrogen is not readily achieved and it is in any case difficult to exclude air during the heat treatment, and for these reasons, vacuum annealing is preferred.

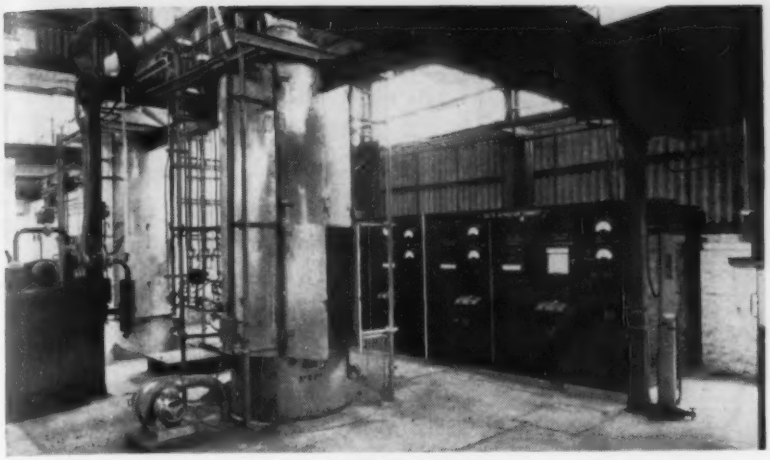
### Sheets readily formed

Zirconium has been annealed satisfactorily by heating at 700°C for 30 min in a vacuum of 2 to 3 microns, but if this period of pressure is greatly exceeded, oxidation becomes harmful. By this means, zirconium sheet of 0.02 to 0.03 in. thickness is being annealed to give Erichsen tests of 0.32 to 0.36 in. on a 1-in. ball, compared to about 0.5 in. on a good deep drawing brass. Such sheet is readily formed to most shapes.

Zirconium work-hardens rapidly, and in any forming operation, it is usually necessary to anneal between operations, but it is not essential to fully anneal by the vacuum method, which is rather laborious and expensive. Satisfactory results are usually achieved by heating for about 30 sec in air at 650°C. This softens the metal without seriously impairing its properties so long as the operation is not repeated too often.

SURGICAL REPAIR plates and screws are among the commercial applications.





FURNACES for the purification and reduction of $ZrCl_4$. Control panels are at the right.

Hot working at temperature below 650°C presents no difficulty and helps considerably in forming the metal.

Deep drawing or cupping of zirconium has been achieved to a limited extent. The work indicates that so long as the metal is annealed, and welding or galling can be prevented by the use of the oxidized surface and lubricants, deep drawing of Kroll zirconium is a practical proposition.

Welding is complicated by the affinity of zirconium for oxygen and nitrogen, but sound butt-welds between sheet as thin as 0.01 in. have been made by the use of the argon arc fusion technique. So far, ductile welds have not been obtained and the metal cracks at the edge of the weld when bent flat, but it is considered that experience will overcome this difficulty as it has been reported in the case of titanium that if great care is taken in welding, ductility can be obtained.

### Machine with hard tools

Spotwelding presents no difficulty and excellent results are obtained.

Turning, milling and shaping operations can be achieved with high-speed steel tools, provided a keen cutting edge is maintained. Blunt tools cause severe work hardening and, therefore, it is considered advisable to use hard metal tools which retain their edge for longer periods. The most suitable grade of tool steel was found to be that used for cast iron.

Satisfactory results are obtained at a cutting speed of 120 fpm, a feed of 0.01 in. and a 0.07 in. depth of cut. In order to avoid ignition of the cutting swarf, high angles and a flat approach angle are used to keep the chips cool. The recommended cutting angles are shown in the table on page 85.

Zirconium metal has been produced of excellent quality and the sponge converted to various forms, but much remains to be done. Machine parts, sheet, rod and wire are all available, while deep drawn parts and tubing are in the experimental stage. Fusion welding by the argon arc process makes sound welds, but ductility has still to be achieved. Spotwelding is simple and effective.

Side by side with the metallurgical development an investigation has been made to find what industries need zirconium and in what forms. The market survey, which is by no means complete, indicates that industry is definitely interested in zirconium but to most technicians it is an unfamiliar metal and its properties unknown, and it will be necessary to educate possible users into thinking of zirconium as a metal which may solve many of their problems.

### Applications are growing

Keen interest has been shown in the possibility of using zirconium in surgery; this has been created by scientific reports emanating from the United States and France. Tests made by electronic engineers show that for many purposes zirconium is the ideal metal. As a constructional material for chemical plants, there is little doubt that zirconium will find many uses, at first in special parts where the high cost is not an important factor compared to the advantages obtained, and later as the price is reduced by increased production, the metal will become used more generally.

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# All carbide tools used on chucking machine

**All tools are carbide on an automatic chucking machine producing an automotive casting. Total machine time, with special chucks, is now less than time formerly required for chucking part.**

**By George Elwers**
*Machinery Editor*

Specially-designed chucks and extensive use of carbide tools feature an interesting automatic chucking machine job on a complex automotive casting. The chucks solve complex holding problems introduced by the design of the part, while the carbides permit high surface speeds and thus contribute to drastically cut production time.

The workpiece is a water pump housing casting. Material is cast iron, 131 to 186 Bhn. A cross-section of this part is shown in Fig. 1. The machine is the new 10-in. Acme-Gridley 6-spindle chucking machine.

The thinness of section of this part, especially the concave face which reduces almost to a knife edge in front of the cored out impeller space, makes it a part difficult to hold in chucks without distortion from tool thrust. In addition, concentricity requirements make necessary extremely accurate positioning of the casting in the chuck. The 1.180-in. and 1.435-in. holes must be concentric within 0.010-in. total indicator reading, to permit accurate alignment of the pump shaft and anti-friction bearing.

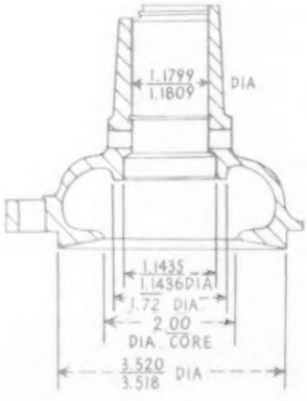


FIG. 1—Cross section of the automotive water pump part machined in 19 sec with carbide tools.

Also, these holes must be accurately located with respect to a flange (which does not show in the cross-section drawing) which has four holes drilled in a secondary operation for bolting the pump housing halves together. The machine is equipped, therefore, with special pot type chucks, visible in Fig. 2, provided with stops arranged to support the piece uniformly on all flanges after chucking up.

The sequence of operations on the machine is as follows:

*First station*: Load and unload.

*Second station*: Rough face flange, rough turn 3.520-in. diam, core drill 1.180-in. hole part way.

*Third station*: Rough face convex face, finish drilling 1.180-in. hole.

*Fourth station*: Counterbore 1.435-in. hole, face 1.72-in. hub.

*Fifth station*: Finish 3.520-in. diam, finish

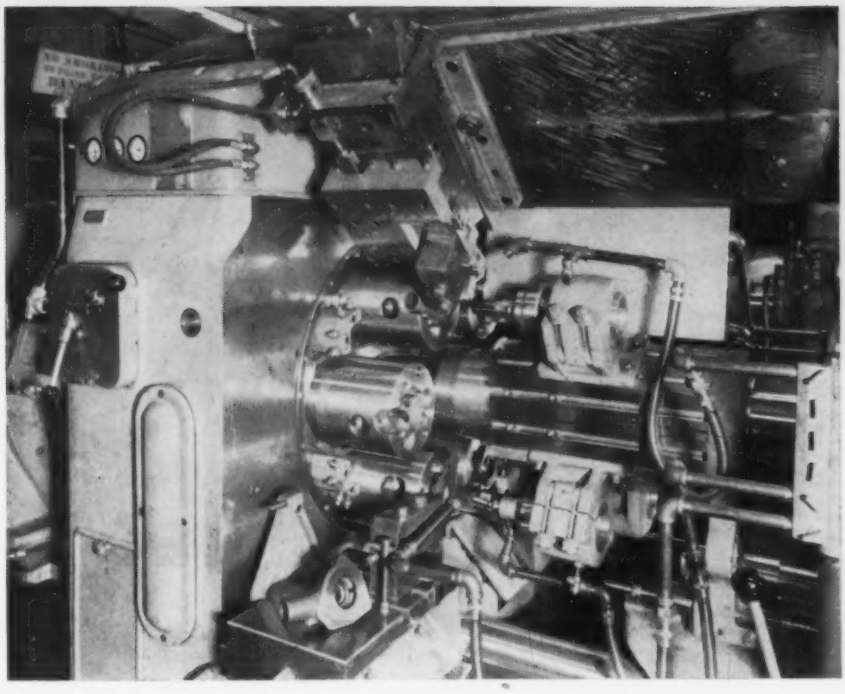

FIG. 2—Part of tooling area on automatic chucking machine. Casting to be machined is seen on cross-slide at lower left. Empty special pot chuck shows at left center.

face flange, finish 1.72-in. hub, and give counterbore a 45° chamfer.

*Sixth station*: Finish convex face, ream 1.435-in. hole.

All operations are performed with carbide tools. Carbide-tipped drills and reamers, and tools with triangular carbide inserts, are used at all stations, except for the facing and chamfering at Station Five, which utilize carbide inserts in a boring bar.

With a spindle speed of 338 rpm, surface speed reaches 498 sfpm. Machine time is 19 sec. This is approximately equal to the time required just for chucking the part in the former method.

# Insulating at service temperatures eliminates cracking

The length of the 125-ft long carbonizers at Disco Corp., Imperial, Pa., increases a full 8 in. by the time this equipment reaches normal operating temperature. The 95-ft roasters increase 5 in. in length. This thermal expansion caused cracking of the insulation until this coal processor's engineers tried insulating the equipment while its metal surfaces were hot. In all, seven roasters and seven carbonizers process over 1000 tons of coal a day, producing a smokeless fuel free of tar, liquors and gases.

To maintain the required process balances in all weather conditions, 66,500 sq ft of mineral wool blankets are needed to insulate the equipment. The roasters, with an average temperature of 750°F, were insulated with a single 4-in. thick blanket. Two such layers were used on the carbonizers, average temperature 975°F. Impaled on studs, that had been welded to the metal sides of the equipment, the blankets were secured with galvanized iron bands wrapped around tightly on 12-in. centers.

After bending over the stud ends which protruded above the metal lathe, two ½-in. layers of mineral wool insulating cement were applied. Sections of 1-in. wire mesh were stretched over the cement and laced together with 18-gage galvanized wire. Staples secured the mesh to the cement. An asphalt mastic finish was trowelled into the mesh to provide a ⅛-in. thick weatherproof covering.

The effectiveness of the insulating job in retaining heat is indicated by the accompanying table.

TEMPERATURES OF INSULATED SURFACES

| Point of Temperature Measurement | Thickness of Mineral Wool, in. | Temperature at Metal Surface, °F | Temperature* on Outside Insulation Surface, °F |
|---|---|---|---|
| Roaster | | | |
| High end | 4 | 900 | 148 |
| Middle | 4 | 750 | 123 |
| Low end | 4 | 600 | 119 |
| Carbonizer | | | |
| High end | 8 | 1050 | 186 |
| Middle | 8 | 975 | 161 |
| Low end | 8 | 900 | 143 |

* Measured with mercury-bulb thermometer completely insulated except for tip against insulation.

# SUPERIOR MACHINABILITY OF MX EXPLAINED

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Little or no published information has been available to explain variations in machinability among Bessemer free-cutting steels of the same chemical specification. A cooperative program designed to obtain such information was conducted by the Battelle Memorial Institute and the U. S. Steel Co. in order to develop practices for making a uniformly superior product. This research program[1] culminated in the development of an improved free-machining Bessemer steel, [2,3,4] known as MX, which has been produced commercially for almost 3 years.

Variables affecting the cutting properties of metals are so complex that machinability is usually best measured by laboratory tests conducted under carefully controlled conditions. A reliable criterion of machinability should involve a machining operation, for present knowledge has not yet reached the point where another type of test can be substituted. It is also desirable that a satisfactory test require a minimum of time, labor and material, and yet be sufficiently sensitive to detect small variations in the cutting characteristics among specimens of the same grade of steel.

### Standard rating set at 100

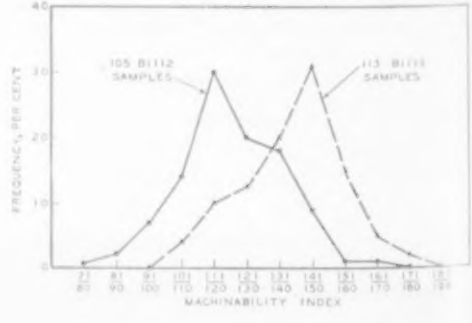
A constant-pressure lathe test[1] met these requirements satisfactorily. In this test, a hot-rolled B-1111 steel is used as a reference standard and is arbitrarily assigned a machinability rating of 100. Steels which have better machining characteristics than this standard receive higher ratings in proportion to their ease of cutting. Those steels which are not as easily machined as the standard receive ratings less than 100.

More than 200 samples of hot-rolled B-1112 and B-1113 Bessemer free-cutting steels were obtained for testing with the lathe. The chemical composition of each specimen was determined and each was examined for microstructure. The bars from which samples were obtained were produced in two different plants by normal commercial practices. Consequently, they presented a good opportunity for correlating machinability with the normal variations in Bessemer steels which met standard specifications.

The average machinability index for the B-1112 steels was 122, and the average for the B-1113 steels was 139. This difference demonstrates the marked superiority to be expected from the higher sulfur B-1113 grade. Many individual bars of both of these grades, however had machinability ratings that were markedly inferior to, or much better than, the average value. The research program started with the premise that such differences would be found and accounted for.

The frequency distributions of machinability ratings for the two grades of steel are shown in Fig. 1. Each point indicates the frequency percentage of samples having machinability indices within the limits marked at the bottom of the frequency polygon. For example, 30 pct of the

FIG. 1—Frequency chart showing distribution of machinability indices of Bessemer free-cutting steels.



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*U. S. Steel Co.*

**Slight difference in silicon content has more effect on machinability than either carbon or phosphorus over the normal ranges found in Bessemer steels. For the first time, data are presented to explain variations in machining among free-cutting steels of the same specification.**

B-1112 steels had machinability indices between 111 and 120. The most interesting fact illustrated by Fig. 1 is the overlap of rating for the two grades of steel. Although many of the B-1113 samples had poorer machinability ratings than some of the B-1112 steels, all of the specimens conformed to the chemical specifications for the grades.

The problem was one of determining not only the cause of the variations in cutting quality for steels of the same grade, but also the reasons for overlapping ratings between grades. Statistical studies were made on data obtained from the commercial B-1112 and B-1113 steels to determine what relationships existed between chemical composition and machinability ratings for each of these grades.

The results of these studies, based on the multiple correlation method of statistical analysis and expressed as "beta correlation coefficients," are summarized in Table I.

## Variables are correlated

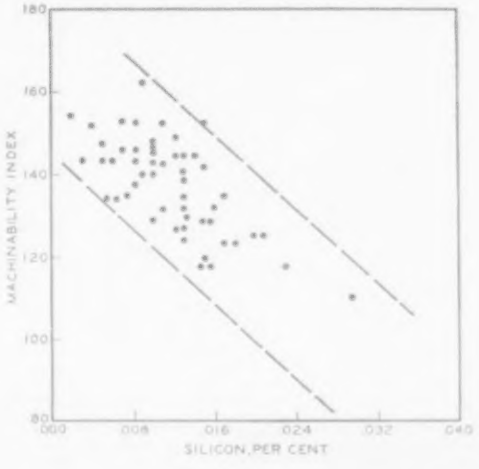
The coefficients indicate the relative importance of each independent variable, in this case the content of each element, in controlling the dependent variable, the machinability rating, and they can vary from +1.0 through 0 to —1.0. A coefficient of +1.0 or —1.0 indicates the strongest possible correlation; zero means that no relationship between the variables was found. The sign of the correlation coefficient indicates whether the relationship between the variables is positive or negative. Variables are considered as having a negative relationship when one increases as the other decreases.

The data in Table I show that the beta correlation coefficient for silicon content and machinability index is —0.390 for the B-1112 specimens investigated and —0.415 for the B-1113 steels. The fact that the coefficients are negative means that increases in silicon content are accompanied by decreases in the machinability ratings. The magnitude of the coefficients indicates that the correlation in both cases is strong and that the relationship is important.

This analysis indicated that, within the limits of composition studied, silicon exerted a greater influence than any other element in affecting machinability ratings. Moreover, the variation in silicon content within each grade as shown in Table 2, indicated that this element was largely responsible for the overlapping ratings between the grades.

Fig. 2 shows the correlation between silicon contents and machinability ratings of 56 B-1113 steels taken at random from normal production. The steels had an average carbon content of 0.11 pct and were made by standard practice at the same plant. Although the scatter in the constant

FIG. 2—Effect of silicon content on the constant-pressure machinability index of commercial B-1113 steels.



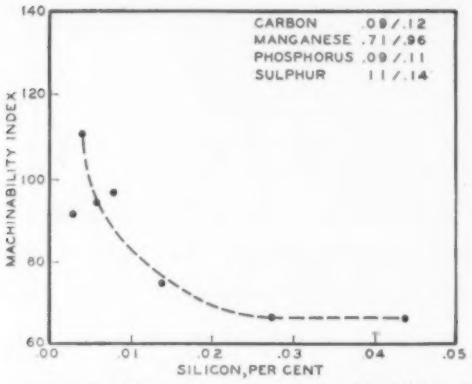



FIG. 3—Effect of silicon on machinability of steels made in a laboratory induction furnace.

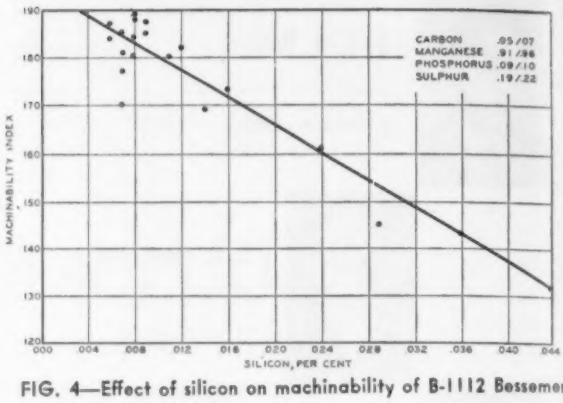



FIG. 4—Effect of silicon on machinability of B-1112 Bessemer steel tested at Battelle.

## Machinability of MX (continued)

pressure test indices at any particular silicon level is quite large because of other variations in composition and because of differences in microstructure, the data nevertheless show clearly the trend of poorer machinability with increasing silicon content.

The sign of the beta correlation coefficients for manganese differs for the two grades. Although this element appears to have a noticeable effect on the B-1112 steels, there is no significant relationship, over the same composition range, for the B-1113 steels. Because of the inconsistency of these results, no statistical inferences relative to the effects of manganese are justified.

The beta correlation coefficients for carbon and phosphorus and the correlation analyses detected no significant effects of these elements on the machinability ratings. However, these elements do affect machinability and data will be presented to show the advantages of maintaining carbon below approximately 0.10 pct for obtaining maximum cutting properties. As shown in Table II, very few specimens were available for a statistical analysis of the effect of carbon below this amount.

The case is a little different for sulfur. The beta coefficients of +0.213 and +0.226, while not high, are consistent and significantly greater than those for carbon and phosphorus. The general superiority of the higher sulfur B-1113 steels compared to B-1112 steels was shown in Fig. 1. Commercial practice over the years has consistently shown that increasing sulfur content improves the machinability of these steels.

Since a large portion of these commercial steels fell within a fairly narrow range in composition, and since the steels were not all made and processed in the same plant, the study on the effect of composition was extended to include steels made under more closely controlled conditions.

### Small variations in Si are important

As shown in Table II, most of the Bessemer free-cutting steels contain less than 0.03 pct Si. Variations up to this amount do not affect most mechanical test results and are generally considered to be unimportant. Bessemer free-machining steels are seldom analyzed for silicon and the permissible contents of this element are not limited by specification. However, the foregoing statistical study indicated that even small differ-

TABLE I

MULTIPLE CORRELATION ANALYSIS

| Element | Range of Composition Studied, pct | Beta Correlation Coefficient* |
|---|---|---|
| **B-1112 Steels** | | |
| Carbon | 0.08/0.14 | −0.1180 |
| Manganese | 0.77/0.99 | +0.2350 |
| Phosphorus | 0.07/0.12 | +0.0093 |
| Sulfur | 0.17/0.24 | +0.2131 |
| Silicon | 0.002/0.045 | −0.3896 |
| **B-1113 Steels** | | |
| Carbon | 0.08/0.15 | −0.0983 |
| Manganese | 0.73/0.94 | −0.0684 |
| Phosphorus | 0.079/0.115 | +0.1330 |
| Sulfur | 0.26/0.38 | +0.2259 |
| Silicon | 0.002/0.033 | −0.4147 |

* Net correlation coefficient, corrected for interactions among elements.

TABLE II

CHEMICAL COMPOSITIONS

| Chemical Element | Content, pct High | Low | Average | Range of Prevalent Composition in Study | Percentage of Samples Within Indicated Prevalent Range |
|---|---|---|---|---|---|
| **B-1112 Steels (105 Specimens)** | | | | | |
| Carbon | 0.14 | 0.08 | 0.11 | 0.10 to 0.12 | 74 |
| Manganese | 0.99 | 0.77 | 0.87 | 0.81 to 0.95 | 82 |
| Phosphorus | 0.12 | 0.07 | 0.09 | 0.08 to 0.10 | 83 |
| Sulfur | 0.24 | 0.17 | 0.20 | 0.18 to 0.22 | 77 |
| Silicon | 0.045 | 0.002 | 0.016 | 0.005 to 0.020 | 79 |
| | | | | 0.005 to 0.016 | 45 |
| **B-1113 Steels (113 Specimens)** | | | | | |
| Carbon | 0.15 | 0.08 | 0.11 | 0.10 to 0.12 | 78 |
| Manganese | 0.94 | 0.73 | 0.83 | 0.76 to 0.90 | 81 |
| Phosphorus | 0.11 | 0.08 | 0.09 | 0.08 to 0.10 | 87 |
| Sulfur | 0.38 | 0.26 | 0.29 | 0.27 to 0.31 | 76 |
| Silicon | 0.033 | 0.002 | 0.011 | 0.005 to 0.020 | 86 |
| | | | | 0.005 to 0.016 | 80 |

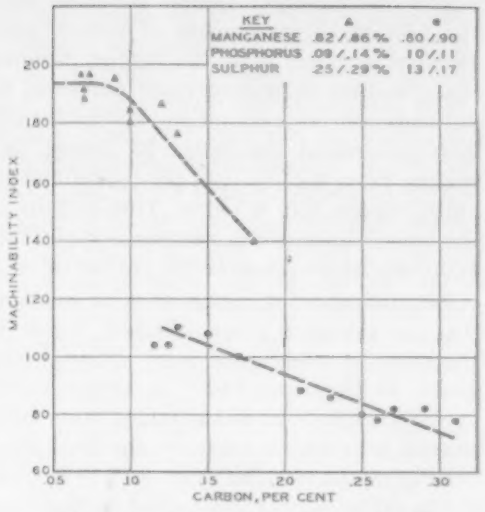



FIG. 5—Effect of carbon on machinability of commercial Bessemer steels at two sulfur levels.

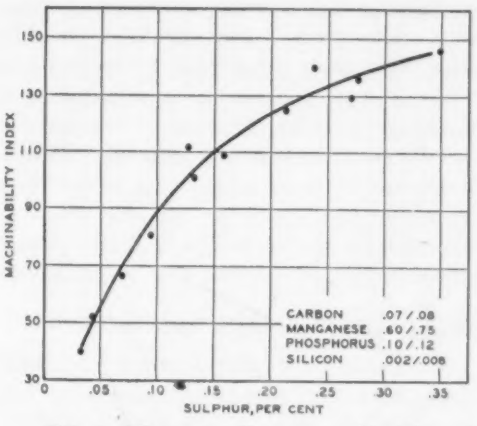



FIG. 6—Effect of sulfur on machinability of steels made in a laboratory induction furnace.

ences in silicon content within the normal range have a marked effect on machinability. This indication was substantiated by tests made on the product of laboratory and special commercial heats.

Machinability ratings of induction-furnace heats, made to approximate the composition of B-1111 steels, are plotted in Fig. 3. In the constant-pressure tests, the machinability rating decreased 1/3 as the silicon content increased from 0.005 to 0.025 pct.

The indices plotted in Fig. 4 were obtained from tests conducted on specimens from a single B-1112 steel specially made to the high side of the sulfur specification and with very low contents of carbon and residual silicon. The silicon contents of successive ingots were varied from 0.004 to 0.044, by making mold additions of ferrosilicon. The carbon contents of the tested specimens averaged approximately 0.07 pct. Since the 20 specimens were obtained from the same heat, they were quite similar with respect to other elements. The detrimental effect of silicon on machinability is apparent.

The graph discloses an approximately linear decrease in machinability index from about 185 for steels containing 0.005 pct Si to 135 for a specimen containing 0.044 pct Si. Tests on several hundred commercial heats have confirmed the advantage of maintaining low silicon levels for optimum cutting properties.

Standard specifications for Bessemer free-cutting steel limit the maximum ladle carbon to 0.13 pct. Ordinarily about ¾ of the steels have carbon contents ranging from 0.10 to 0.12 pct. The effect of carbon upon the machinability index obtained on 13 steels simulating B-1111 composition is shown in Fig. 5. The test specimens were obtained from heats made in an induction furnace under controlled melting conditions, and identical rolling practices were used in processing the ingots into test bars.

Tests showed a tendency for the machinability ratings to decrease when the carbon content exceeds approximately 0.06 pct. However, the two steels containing 0.09 pct C had ratings comparable to those for steels containing only about half as much carbon.

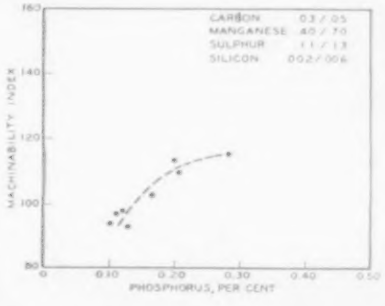
## Higher carbons are detrimental

Fig. 5 shows the results of machinability tests conducted on specimens obtained from special commercially produced Bessemer steels. Data plotted at the top of the chart are for specimens from 10 ingots of a heat of B-1113 to which mold additions were made for the purpose of varying the carbon contents. The ingots were all processed at the same time, using normal mill practices. The samples containing 0.06 to 0.09 pct C had equally good machinability ratings. The bars with carbon contents of 0.10 pct or more were poorer. The specimen with 0.17 pct C had a rating approximately 30 pct poorer than the low-carbon specimens from the same heat.

The lower graph in Fig. 5 shows the effect of higher carbon contents on the machinability of Bessemer steels. These steels were made with about 0.15 pct S for special applications requiring high strengths and good machinability. A consistent decrease in machinability rating with increasing carbon content in the range from 0.12 to 0.32 pct is shown.

Carbon contents above approximately 0.09 pct impair the machinability of Bessemer free-cut-

FIG. 7—Effect of phosphorus on machinability of steels made in a laboratory induction furnace.



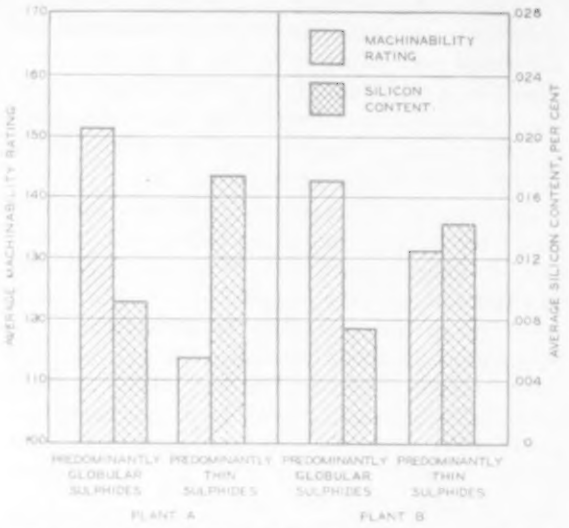



**FIG. 8—Average machinability ratings and silicon contents for B-1113 steels in which various sulfide types distinctly predominated.**

## Machinability of MX (continued)

ting steels. Machinability ratings obtained on a great number of commercial blows have fully corroborated this detrimental effect of carbon. Consequently, the carbon content of MX free-cutting steel, developed in this research program, is held to a maximum of 0.08 pct. Comparatively little benefit would be gained from lower carbon contents.

Sulfur usually occurs in steel in combination with iron and manganese; with sufficient manganese it is present as manganese sulfide inclusions. Merchant[5] has shown that the sulfide inclusions improve machinability by reducing the friction between the chip and the cutting tool. This friction is considered to be one of the most important factors affecting the performance of steels in metal cutting operations.

The data plotted in Fig. 6 illustrate, quantitatively, the improvement in machinability resulting from increasing the sulfur content of steel. The data are for steels made in the laboratory and processed under controlled conditions.

The machinability indices obtained show that the first small increments of sulfur, above the residual amount, give the largest benefits, and that the rate of improvement decreases at high sulfur levels. Increasing the sulfur from 0.05 to 0.10 pct raised the index 33 units; an equal change from 0.25 to 0.30 pct raised the machinability index only 6 units. This conformance to the law of diminishing returns is typical of many additions which improve the properties of metals.

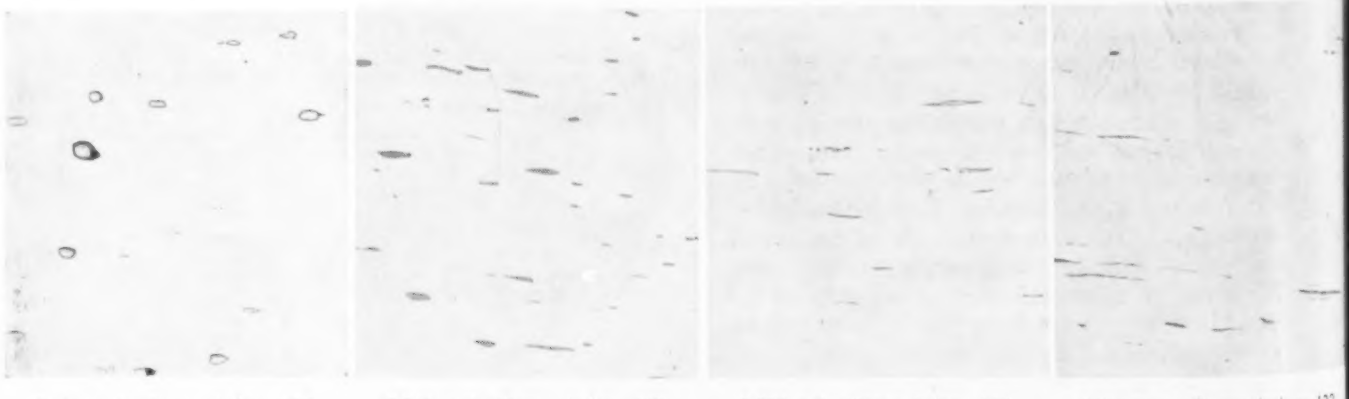
The influence of manganese on machinability was not extensively investigated. Some data on the effect of manganese were obtained from two series of Bessemer blows in which sulfur was varied by additions to the molds. One series had normal manganese contents for Bessemer free-cutting steels, ranging from 0.73 to 0.91 pct and, in the other, manganese varied from 0.53 to 0.63 pct. In each series the sulfur content varied from approximately 0.025 to approximately 0.20 pct. At the higher sulfur contents, the steels containing the normal amounts of manganese were somewhat better from a machinability standpoint than those with lower manganese.

Since phosphorus is not eliminated in the acid Bessemer process, Bessemer free-cutting steels usually contains 0.08 to 0.10 pct P. Because these steels cannot be produced with lower phosphorus contents using available raw materials, only the influence on machinability of higher than normal amounts of this element was investigated.

### Higher phos contents beneficial

Tests on induction-furnace rephosphorized steels with very low carbon and silicon contents are shown in Fig. 7. The carbon contents were reduced to compensate for the tensile increase of the high phosphorus levels. The strengths and hardnesses were similar to conventional Bessemer steels. The machinability ratings improved as the phosphorus was raised from 0.10 to 0.28 pct. The effect of greater amounts of phosphorus on machinability was not determined. Results on different heats were consistent and the change in rating of 20 units was large enough to be significant.

FIG. 9—Typical sulfide inclusions in bars containing various amounts of silicon from one Bessemer B-1112 blow, 100X.



0.009 pct silicon; index—187 | 0.012 pct silicon; index—182 | 0.029 pct silicon; index—145 | 0.044 pct silicon; index—132

During the course of the research program, several hundred specimens from the commercial heats, as well as from the small laboratory induction heats, were examined microscopically after machinability tests and chemical analyses had been made. In general, those steels in which the sulfide inclusions tended to be more nearly globular in shape had better machinability than those in which stringy, elongated sulfides predominated. This relationship between sulfide shape and cutting characteristics was demonstrated for steels containing similar amounts of the usually specified elements, i.e., carbon, manganese, phosphorus and sulfur.

Chemical analyses showed that differences in sulfide shape and machinability were usually associated with variations in the silicon contents; the lower the silicon, the more globular the sulfides and the better the machining characteristics. This relationship between machinability ratings, sulfide shape and silicon content for commercial B-1113 steels from two producing plants, is shown in Fig. 8. Each graph is based on examinations made on specimens from approximately 60 heats from each plant.

### Type of inclusions are important

As shown in Fig. 4 machinability decreased practically in direct proportion to the amount of silicon present. Metallographic examination of the bars from this blow disclosed that the sulfides became more and more elongated as the silicon content was progressively increased. Photomicrographs of typical inclusions found in several bars of different silicon content are presented in Figs. 9A to 9D, inclusive, together with the machinability ratings and corresponding silicon content. The machinability of this series of steels was evaluated by the tool life method, as well as in the constant pressure lathe, and both tests rated the bars in the same relative order.

The shape of the sulfide inclusions in commercial steels is not controlled by the silicon content alone and occasionally many globular sulfides were observed in bars containing relatively high amounts of this element. Those specimens in which the globular sulfides predominated usually exhibited excellent cutting properties despite the higher silicon content.

The data from commercial heats showed that low machinability ratings were obtained on specimens containing the largest number of oxide type inclusions. These inclusions were usually most prevalent in the steels with the highest silicon contents, indicating that they were impure silicates.

It is believed, but as yet not definitely established, that small variations in the silicon content of low carbon free-cutting steels affect the type of sulfide through some influence on oxygen content. Because the effect of carbon, silicon and inclusion type of machinability is commercially significant, the MX steel is made with controlled low carbon and silicon contents.

The performance of thousands of tons of this new steel in machine shops has fully corroborated the laboratory data. Because of the low carbon and low silicon contents, its superior machinability has permitted faster cutting speeds and given better tool performance in a variety of machining operations.[3] Moreover, it has been shown to have better cold forming properties when compared to normal product.

#### References


[1] *F. W. Boulger, H. L. Shaw and H. E. Johnson, "Constant Pressure Lathe Test for Measuring the Machinability of Free-Cutting Steels," Trans. ASME, vol. 71, No. 5, July 1949, p. 431.*

[2] *"Free-Machining Steel," U. S. Patent 2,485,358, issued to S. L. Case.*

[3] *A. W. MacLaren and L. W. Oswald, "Better Machinability With MX Steel," The Iron Age, Feb. 2, 1950 p. 86.*

[4] *G. R. Caskey, "Superior Machining at Lower Cost With MX," The Iron Age, May 18, 1950, p. 95.*

[5] *M. Eugene Merchant and Norman Zlatin, "Basic Reasons for Good Machinability of Free-Machining Steels," Trans. ASM, vol. 41, p. 647.*


## NEW BOOKS

*Handbook on Designing for Quantity Production,* by Herbert Chase, has as its purpose, to provide as much practical information on this subject as can be compressed within a volume of its size. It is intended not only for reference by engineers already engaged in design, but also as a textbook for use by students of engineering who must understand practical considerations relating to production before they can apply the theory of design with optimum economic results. Specific rules for design are given, and various mass-produced items are compared. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18. $7.50. 564 p.

*Elements of Ore Dressing,* by A. F. Taggart, presents ore dressing facts necessary for "engineering" thinking, offers laboratory instructions based on 30 years' experience, and gives theories tested in design and control of operations. Empirical generalizations most commonly employed are used, and the book includes recent advances in operating techniques in fine crushing, grinding, dewatering and sink-float concentration. Emphasis is on the analysis of machines and processes and the identification of their elements with established scientific laws. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16. $10.00. 596 p.

# 'FIGHT TOOL WASTE' aids offered

**Tool manufacturer offers free aids for setting up program to cut waste by prolonging tool life.**

UNIVERSITY OF MICHIGAN LIBRARIES

A campaign to conserve critical materials by prolonging tool life has been initiated by Henry Disston & Sons, Inc. The campaign consists of a plan urging the users of saws, files, knives and other tools Disston manufactures, to

TYPICAL of the cards now being distributed are these four. The backs of cards 7 and 11 are not shown.

Disston **FIGHT WASTE** *Card 3*

**Milling Saws**
**FOR FERROUS OR NON-FERROUS METALS**
**CIRCULAR—HIGH TEMPER**

**How to obtain greater efficiency and make saws last longer.**

| FAILURE | CAUSE | CORRECTION |
|---|---|---|
| **Premature wear** | Operating speed too high for material. | Do not exceed 60 ft. per minute for ferrous materials. See recommendations on other side. |
| | Feed too light. | Increase feed until chip is normal. See recommendations on other side. |
| **Tooth breakage** | Stock slipping or turning. | Inspect clamping device. Use V block to hold rounds. |
| | Saw slipping on arbor. | Always use key or tug pins. Do not depend upon collars for clamping. |
| | Saw chatter. | Overhaul gearing to remove backlash. |
| **Blade breakage** | Stock slipping or turning. | Clamp stock rigidly. |
| | Saw slipping on arbor. | Drive with key or tug pins. |
| | Hanging up in cut due to irregular feed | Inspect feed mechanism. Overhaul or re-new worn parts. |

(CONTINUED ON OTHER SIDE)

**Correct use of tools . . . makes work easier . . . saves vital materials**

**Milling Saws**
**CIRCULAR—HIGH TEMPER**
(continued)

**RECOMMENDATIONS**

| Material to be cut | Saw Arbor Above Work | | Saw Arbor Below Work | | Rim Speed in Feet Per Min. | Feed in Inches Per Min. |
|---|---|---|---|---|---|---|
| | Style Tooth | Hook Angle | Style Tooth | Hook Angle | | |
| Steel (tool & alloy) | 3 | Rad. | 3 | 5° | 40-60 | 1/16-2 1/2 |
| Steel (tool & alloy) | 2 | Rad. | 6 | 5° | 40-60 | 1/16-2 1/2 |
| Steel (low carbon) | 3 | Rad. | 3 | 5° | 40-60 | 2-3 1/2 |
| Steel (low carbon) | 2 | Rad. | 2 | 10° | 40-60 | 2-3 1/2 |
| Cast Iron | 3 | Rad. | 3 | Rad. | 50-70 | 3-5 |
| Bronze | 3 | Rad. | 3 | 10° | 150-250 | 10-15 |
| Brass | 3 | Rad. | 3 | 15° | 300-700 | 12-20 |
| Copper | 1 | 5° | 1 | 20° | 500-700 | 10-20 |
| Copper | 3 | 5° | 3 | 20° | 500-700 | 10-20 |
| Aluminum | 1 | 10° | 1 | 25° | 800-1000 | 40-80 |
| Monel | 3 | Rad. | 3 | 5° | 100-200 | 2-3 1/2 |

**STYLE 1** Regular Straight Metal Saw Tooth

**STYLE 2** Alternate Square and Beveled Metal Saw Tooth

**STYLE 3** Regular Topped Moul Saw Tooth

**HENRY DISSTON & SONS, INC., PHILADELPHIA 35, PA., U. S. A.**

*In Peace Waste is a Sin* — FIGHT WASTE — **NOW**... *Waste is a Crime*

Copyright 1950 . . . HENRY DISSTON & SONS, INC. Printed in U.S.A.

Disston **FIGHT WASTE** *Card 7*

**Flexible Back Metal Band Saws**

**How to obtain greater efficiency and make saws last longer.**

| FAILURE | CAUSE | CORRECTION |
|---|---|---|
| **Stripping teeth** | Tooth spacing too coarse. | Use recommended spacing. |
| | Starting cut at extremely thin section of material or on a corner. | Start cut where several teeth will contact material at same time. |
| **Premature wear and loss of set** | Speed too fast. | Reduce—see recommendations. |
| | Rubbing in guides. | Adjust so that teeth project beyond guides—also so the teeth project over edge of wheels. |
| | Riding on wheels. | |
| **Breaking** | Twisting in the cut. | If irregular cutting, use proper width saw for radius. |
| | Misalignment of guides. | Adjust so that top and bottom guides are in alignment. |
| | Guides set too far apart, allow band to twist. | Always adjust guides as close as possible to piece being cut. |
| | Insufficient tension. | Adjust tension to approximately 300 lbs. per inch of saw width. |
| | Allowing band to remain in tension when not in use. | Remove saw from machine or release tension. Where extreme differences of temperature occur, this practice will prevent breakage. |
| **Cutting out of line** | Misalignment of guides. | Adjustment should be made. |
| | Spacing of guides. | Set as close as possible. |
| | Set worn on one side due to contact with wheels or guides. | Adjust so that teeth project beyond guides—also so the teeth project over edge of wheels. |
| | Feed too heavy. | Reduce feed or use coarse tooth saw. |

(CONTINUED ON OTHER SIDE)

**Correct use of tools . . . makes work easier . . . saves vital materials**

make these tools last longer, and showing them how to do it.

The plan not only aims at management an appeal to conserve materials, but reaches straight down the line to the men who use the tools and on whom the success of the campaign depends.

To reach the workmen, Disston has developed special cards which are the heart of its plan. There are 30 different 4x6-in. cards, one for each major Disston tool. Each card tells how to use the respective tool, what abuses may reduce its performance, and what should be done to prolong its service life. The cards are printed on heavy stock, sturdy enough to stand plenty of handling in the shop, and are provided with holes for hanging at the point of use of each tool. Typical cards are illustrated.

General information concerning the proper use of the tools appears on the front of the cards. On the back is found salient information in greater detail.

### Foreman's Manual Is Used

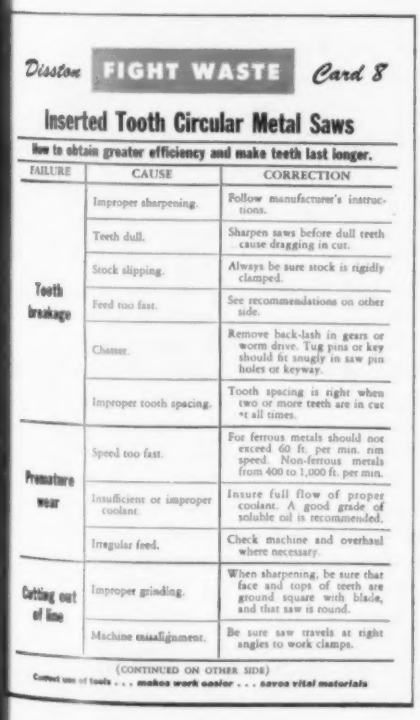
A basic element in the Disston plan is a foreman's manual. In it are illustrations of each card, and an explanation of the conservation plan and the purpose behind it. Supplementing this manual is a handbook designed to indoctrinate Disston's distributors in the broad aspects of the campaign, and tell the distributor's salesmen how to present it to their customers.

The plan also includes a special management folder which relates the program to the requirements of top management, and suggests how it can be put into operation in a plant. The "Fight Waste" kit also contains posters for bulletin boards, stickers for correspondence, and other supplementary material.

***Cards covering these tools are available:***

| Card No. | Tool | Card No. | Tool |
|---|---|---|---|
| 1 | Power hacksaw blades | 16 | Narrow woodcutting bandsaws |
| 2 | Hand hacksaw blades | 17 | Dado cutters |
| 3 | Milling saws | 18 | Circular woodcutting saws |
| 4 | Nonferrous saws | 19 | Circular combination woodcutting saws |
| 5 | Carboloy saws | 20 | Flat ground woodcutting circular saws |
| 6 | Carboloy knives, cutters | 21 | Circular edger saws |
| 7 | Flexible metal bandsaws | 22 | Circular trimmer saws |
| 8 | Circular metal saws | 23 | Narrow bandsaws for plastics |
| 9 | Files, general | 24 | Circular plastics saws |
| 10 | Saw files | 25 | Circular knives |
| 11 | Machinist's files | 26 | Paper knives |
| 12 | Special purpose and woodworking files | 27 | Thin planer knives |
| 13 | Swiss pattern files | 28 | Heavy planer knives |
| 14 | Refitting circular saws | 29 | Veneer knives |
| 15 | Wide bandsaws for wood | 30 | Chipper knives |

All of the material is available free of charge from Henry Disston & Sons, Inc., Philadelphia, including as many individual cards as are needed to cover all points of tool use in each participating plant.



Disston FIGHT WASTE Card 8

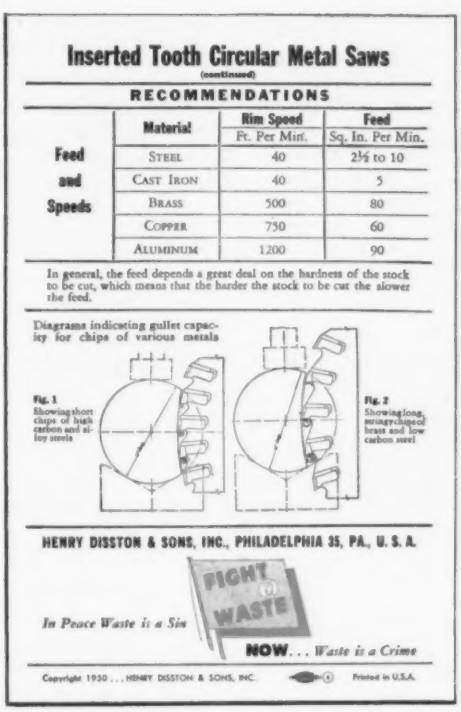
**Inserted Tooth Circular Metal Saws**

How to obtain greater efficiency and make teeth last longer.

| FAILURE | CAUSE | CORRECTION |
|---|---|---|
| Tooth breakage | Improper sharpening. | Follow manufacturer's instructions. |
| | Teeth dull. | Sharpen saws before dull teeth cause dragging in cut. |
| | Stock slipping. | Always be sure stock is rigidly clamped. |
| | Feed too fast. | See recommendations on other side. |
| | Chatter. | Remove back-lash in gears or worm drive. Tug pins or key should fit snugly in saw pin holes or keyway. |
| | Improper tooth spacing. | Tooth spacing is right when two or more teeth are in cut at all times. |
| Premature wear | Speed too fast. | For ferrous metals should not exceed 60 ft. per min. rim speed. Non-ferrous metals from 400 to 1,000 ft. per min. |
| | Insufficient or improper coolant. | Insure full flow of proper coolant. A good grade of soluble oil is recommended. |
| | Irregular feed. | Check machine and overhaul where necessary. |
| Cutting out of line | Improper grinding. | When sharpening, be sure that face and tops of teeth are ground square with blade, and that saw is round. |
| | Machine misalignment. | Be sure saw travels at right angles to work clamps. |

(CONTINUED ON OTHER SIDE)

Correct use of tools . . . makes work easier . . . saves vital materials



**Inserted Tooth Circular Metal Saws**

(continued)

RECOMMENDATIONS

| | Material | Rim Speed Ft. Per Min. | Feed Sq. In. Per Min. |
|---|---|---|---|
| Feed and Speeds | Steel | 40 | 2½ to 10 |
| | Cast Iron | 40 | 5 |
| | Brass | 500 | 80 |
| | Copper | 750 | 60 |
| | Aluminum | 1200 | 90 |

In general, the feed depends a great deal on the hardness of the stock to be cut, which means that the harder the stock to be cut the slower the feed.

Diagrams indicating gullet capacity for chips of various metals

Fig. 1 Showing short chips of high carbon and alloy steels

Fig. 2 Showing long, stringy chips of brass and low carbon steel

HENRY DISSTON & SONS, INC., PHILADELPHIA 35, PA., U. S. A.

*In Peace Waste is a Sin*

FIGHT WASTE

NOW . . . *Waste is a Crime*

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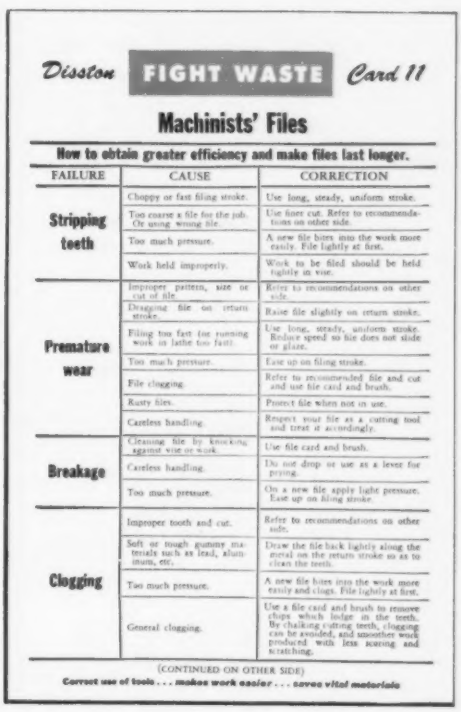

Disston FIGHT WASTE Card 11

**Machinists' Files**

How to obtain greater efficiency and make files last longer.

| FAILURE | CAUSE | CORRECTION |
|---|---|---|
| Stripping teeth | Choppy or fast filing stroke. | Use long, steady, uniform stroke. |
| | Too coarse a file for the job. Or using wrong file. | Use finer cut. Refer to recommendations on other side. |
| | Too much pressure. | A new file bites into the work more easily. File lightly at first. |
| | Work held improperly. | Work to be filed should be held tightly in vise. |
| Premature wear | Improper pattern, size or cut of file. | Refer to recommendations on other side. |
| | Dragging file on return stroke. | Raise file slightly on return stroke. |
| | Filing too fast for running work in lathe too fast. | Use long, steady, uniform stroke. Reduce speed so file does not slide or glaze. |
| | Too much pressure. | Ease up on filing stroke. |
| | File clogging. | Refer to recommended file and cut and use file card and brush. |
| | Rusty files. | Protect file when not in use. |
| | Careless handling. | Respect your file as a cutting tool and treat it accordingly. |
| Breakage | Cleaning file by knocking against vise or work. | Use file card and brush. |
| | Careless handling. | Do not drop or use as a lever for prying. |
| | Too much pressure. | On a new file apply light pressure. Ease up on filing stroke. |
| Clogging | Improper tooth and cut. | Refer to recommendations on other side. |
| | Soft or tough gummy materials such as lead, aluminum, etc. | Draw the file back lightly along the metal on the return stroke so as to clean the teeth. |
| | Too much pressure. | A new file bites into the work more easily and clogs. File lightly at first. |
| | General clogging. | Use a file card and brush to remove chips which lodge in the teeth. By chalking cutting teeth, clogging can be avoided, and smoother work produced with less scoring and scratching. |

(CONTINUED ON OTHER SIDE)

Correct use of tools . . . makes work easier . . . saves vital materials

**R. F. Jones**
*Purchasing Agent Plant Equipment*
*Lockheed Aircraft Corp.*
*Burbank Calif.*

# New milling machine

## PLANNED FOR AIRCRAFT MAKERS

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**A new type of contour milling machine has been proposed by the aircraft industry. The Air Force has contracted with Lockheed to have it designed and built. Its unique feature is complete control of the cutter head, in angular tilt as well as horizontal travel, through three separate templates. The machine will have uses in many other industries.**

Construction of a revolutionary new type of machine tool has been authorized by the Air Force. A contract to have the machine built has been awarded to the Lockheed Aircraft Corp., and inquiries to machine tool builders have been made.

The machine is called a universal contour mill. Its unique feature is complete control of the cutter head, in angular tilt as well as horizontal travel, through three separate templates.

The machine is of interest to the aircraft industry for finishing the flanges of one-piece structural elements, such as forged spars and ribs. It is predicted that automotive, marine and other industries will also find useful applications for such a machine.

What the machine might look like is shown in Fig. 1, which also indicates how the three templates will be used. Proposed specifications for the machine include a maximum main saddle travel of 144 in. and a ram travel of 48 in. Longitudinal and cross feed would range from 2 to 50 ipm. Power would be from a direct-connected 1800/3600, 10/20 hp motor.

Angular movement of the cutter head would include tilt about the axis parallel to the table

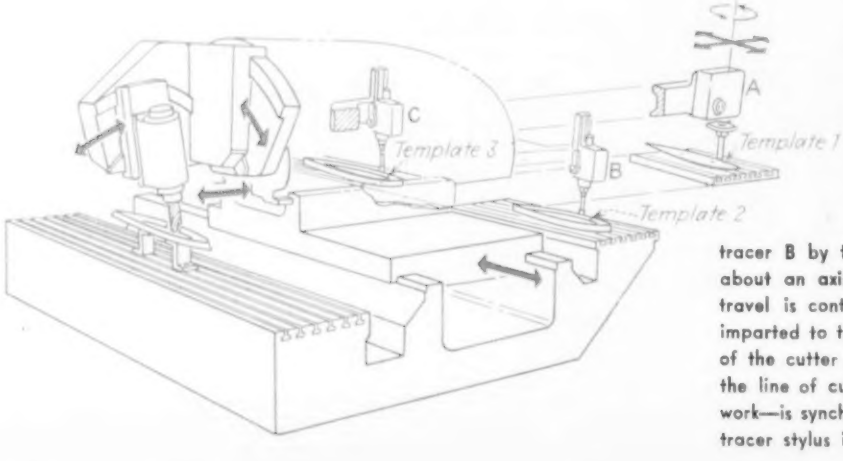



FIG. 1—This sketch of the universal contour milling machine is based on proposed specifications. Table travel (1) and ram travel (2) are controlled by the 360° tracer A, following template 1. Angular movement (3) about an axis parallel to the direction of ram travel is controlled by the vertical displacement imparted to tracer B by template 2. Angular movement (4) about an axis parallel to the direction of table travel is controlled by the vertical displacement imparted to tracer C by template 3. The rotation of the cutter motor in an eccentric "quill" about the line of cut—the attitude of the cutter to the work—is synchronized with the position of the 360° tracer stylus in respect to the profile template 1.

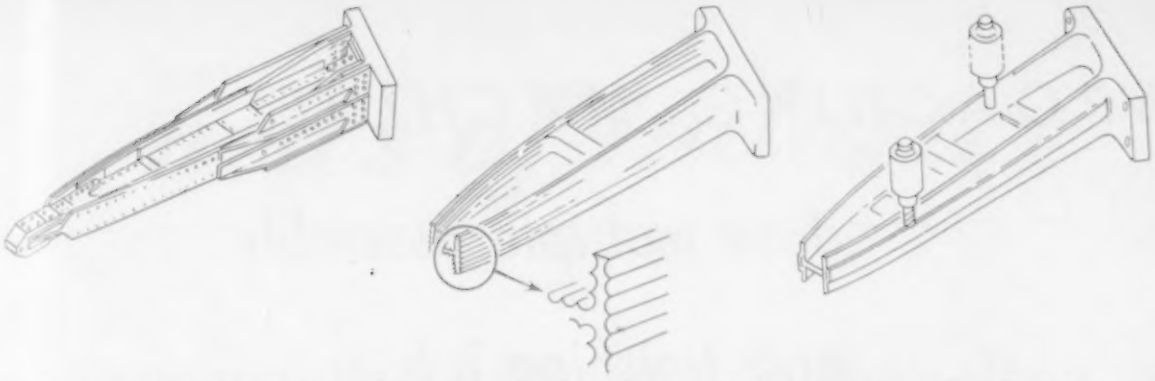


FIG. 2—A typical aircraft part which could be produced easier and better with the help of the contour mill. At left, as a built-up assembly, the part would include 25 different pieces, and would require 31 templates, 32 tools, 14 fixtures and 8 jigs for manufacture. As a forging, the part could be machined with present duplicating milling machines in about 30 hr, but would then require hand blending to finish the machined surface, center. The same forging could be machined to a finished surface, right, in 1.32 hr with the proposed contour mill.

travel of 20° on each side of vertical. Tilt about the axis parallel to ram travel would be 45° on one side of vertical and 20° on the opposite side. The saddle tilt mechanism could be raised or lowered through 8 in. The spindle carrier adjustment would be 4 in. maximum along the spindle axis.

Tracer control, as explained in Fig. 1, would include a 360° automatic profiling unit to control milling in a horizontal plane and impart synchronous rotation of the spindle in its eccentric housing. The spindle drum eccentric would permit adjustment for cutter diameter, control from edge of cutter for contour milling, and control from center for conventional profile milling. Two pilot controls would translate vertical displacement of styluses into angular movement of the cutter in each of two planes.

### Fabrication time is cut

A typical example of the work for which the contour mill will be useful is illustrated in Fig. 2. On the left is shown the typical part as it would be made by the methods common in the aircraft industry today. It would have 25 different parts exclusive of fasteners, require 63 templates and tools, 14 fixtures, and 8 drill and assembly jigs. Fabrication and assembly time, based on 100 parts, would be 77 hr per part.

Such a part could be made on a milling machine with one of the duplicating systems in commercial use today. About 30 machine hr would be required, and the routed surface would have to be hand blended.

A contour mill built to the proposed specifications would be able to machine this part in 1.32 hr, with no hand blending required. A complete comparison of cost and time estimates is given in the accompanying table.

Utilization of the contour mill in the aircraft industry would offer many benefits. To the designer, it would permit a wider design expedient whereby larger structural members could be employed. Complicated joints and attachments in the part would be eliminated. An economical means to produce smooth aerodynamic contours would be provided. Rigid members could be designed, not limited in location or direction by machining limitations.

The mill would allow design for more efficient use of materials, by permitting extension of main structural members to the airplane skin surface. Weight savings would result from elimination of complex structural joints and more efficient distribution of materials in the part.

### Assembly costs are less

For the manufacturing engineer, the mill would enable reduction of the complexity and number of tools required for production of the part, and eliminate expensive jigs and fixtures. Tool storage, maintenance and handling costs would be minimized. Overall fabrication and assembly costs would be cut.

This type of work can be done with equipment now available, but the contour mill would for the first time permit finish machining of contoured structural components having variable flange angles. And the cost of production would be much less than with present equipment.

Most of these benefits would be obtained in many industries besides the aircraft industry. The contour mill will prove valuable wherever loft lines and methods are factors in development of the end product.

ESTIMATED COMPARATIVE COSTS*

| | No. of Pieces | Material Cost | Planning, tool design, tool mfg. hr | Fabricating and assembly, hr | Total Cost per part |
|---|---|---|---|---|---|
| Built-up assembly | 25 | $30.00 | 6,338 | 77.40 | $593.00 |
| Present milling equipment | 1 | 167.28 | 888 | 40.67 | 387.00 |
| Contour mill | 1 | 167.28 | 859 | 3.65 | 217.00 |

*For the part shown in Fig. 2. Costs based on a four-lot setup for a total of 100 parts, amortizing all tooling.

# BROACHING MACHINE

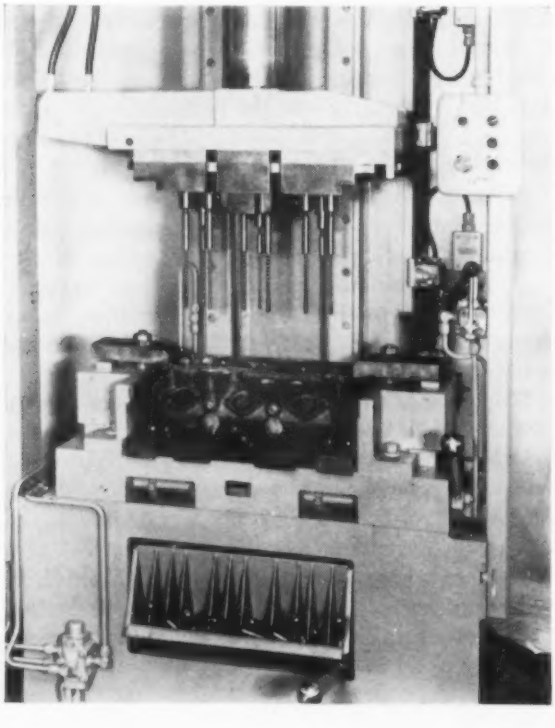
## does multiple assembly and finishing job

Though broaching machines are largely single-purpose machines, some are used to perform multiple operations. A tractor manufacturer, for example, uses a broaching machine to broach 9 valve and push rod guide bores to size in an engine cylinder head. The same machine also assembles the valve and push rod guides in place, and broaches them to size. All this is done in two working strokes of the machine, without moving the cylinder head.

In operation, the operator slides the head into place in the machine. Retracting pins interlocked with machine operation locate the head while it is being locked in position.

Nine broaches, six for valve guide bores and three for push rod guide bores, now broach the bores on the down stroke of the press. At the end of the stroke the broaches are automatically released and drop into a partitioned receptacle in the base of the machine. Meanwhile the head of the machine returns to upper position automatically.

TWO STROKES of this 15-ton Colonial broaching machine broach nine valve and push rod guide bores, insert the guides, and broach to size, in a tractor engine cylinder head.



The broaches for broaching the guides themselves are, meanwhile, placed in an aluminum pallet and the corresponding valve or push rod guides are slipped over the ends of the broaches. The light-weight pallet is lifted into position under the head, engaging the broach ends in the pullers. A lever locks the broaches. The pallet is removed and the head moves down. As it does, the guides are pushed into the broached bores, a definite stop for the head assuring that they are pushed into exactly the right depth. On the return stroke of the head, the broaches are now pulled through the guides, finishing them to size.

The pallet is lifted in place and the broaches are released, dropping into their respective receptacles in the pallet.

A lever at the base of the machine is used to bring the receptacle containing the guide-bore broaches out of the base of the machine. These broaches are manually re-inserted in the head, ready for the next cylinder head.

Among the advantages of the setup are that the valve guide broaches actually serve as inspection tools for the fit of the guides in their bores. If the fit is too light, the broach pulls the guide back out on the return stroke, since it takes less effort to broach the ID of the guides than to push the guides into place if the fit is correct.

Performing all operations in the same setup also assures that the spacing between all the valve and push rod guides are accurately maintained. Accuracy of the entire operation is indicated by the tolerance on the ID of the finished guides—which are held to 0.0005 in. The same tolerance is specified for the bores into which the guides are pressed.

The setup is so designed that two different sizes of cylinder heads—for two different engines—can be processed on the same machine. Different broach sizes are used, of course, for the two heads.

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# news of industry

## Two Aluminum Users Planning to Make Their Own

**Metal Trims, Inc., and Himmel Brothers form Independent Aluminum Corp. to build 120 million-lb reduction plant in Pacific Northwest . . . Await U. S. approval**—*By John Delaney.*

**Youngstown, Ohio**—A determined group of independent aluminum consumers is within a gnat's hair of obtaining government blessing for construction of a 120 million - lb aluminum reduction plant in the Pacific Northwest.

The question of power to operate the plant is the only important stumbling block to a go-ahead in the form of a $50 million certificate of necessity. At least, that's the latest word from the U. S. Dept. of Interior.

Officials of the Independent Aluminum Corp., which would operate the plant, point to a commitment from Bonneville Power Administration to supply 40,000 kw beginning in the fall of 1952 to operate the first of three potlines. An additional 80,000 kw would be needed as the other potlines are started up.

### At the Helm

Independent Aluminum is composed of officers of two aluminum fabricators—Metal Trims, Inc., Youngstown, and Himmel Brothers, New Haven, Conn. They are president—George Mitchell, vice-president of Metal Trims; executive vice-president—Eugene Dynner, vice-president of Metal Trims; vice-president — Fred Himmel, president of Himmel Brothers; treasurer—Albert Mitchell, treasurer of Metal Trims; secretary—Murray Himmel, of Himmel Brothers. Originally a number of other small fabricators were behind the proposal, but they are not now actively involved.

If the project materializes, Metal Trims and Himmel Brothers propose to locate fabricating plants nearby the reduction facility.

The story of how the proposed plant progressed from an idea to its present stage reads like a case study on what small business can accomplish with a bit of determination and savvy. Total net worth of the two companies is about $1.2 million. They had an idea and sold it to government officials.

### Spadework by Metal Trims

Most of the spadework has been done by Metal Trims. It has carried on negotiations with interested government departments, suppliers and financial interests. Eugene Dynner outlined the plan before the sub-committee on monopoly of the House Judiciary Committee last Jan. 26. Application for the certificate of necessity was filed Apr. 22. Ivan Bloch, Portland, Ore., industrial consultant, handled technical details. Legal matters are in the hands of Arnold, Fortas and Potter, Washington, D. C.

Once the certificate of necessity is issued, Independent Aluminum Corp. is prepared to move quickly. Sources of raw materials are being lined up. Discussions have been held with suppliers of neces-

*Turn Page*

### Deny Merger Rumors

**Sharon, Pa. — Sharon Steel Corp.'s purchase of 142,500 shares of common stock of the National Supply Co. revived speculation of an eventual merger of the two companies. Both firms recently denied rumors of a pending merger.**

**They indicated that there is little likelihood of an amalgamation at any time in the near future. At the present market price, Sharon paid out in the neighborhood of $4 million for the National Supply stock.**

### Steel Industry, NPA Summon Advertising Help to Get Scrap

**New York**—The steel industry through its Committee on Iron and Steel Scrap, American Iron & Steel Institute, has summoned advertising to stimulate the flow of scrap metal. NPA also added its voice to the plea for assistance.

Robert D. Mossman, Jones & Laughlin advertising manager, will serve as volunteer coordinator of an emergency steel scrap salvage advertising campaign sponsored by the Advertising Council.

Although in 1949, the Council held a short steel scrap ad campaign, this new program will be on a long-term basis. Representatives of the AISI committee and NPA will cooperate.

### Aluminum Lightens New Liner

**Pittsburgh**— Some 2000 tons of aluminum will be used in building the S. S. United States, new trans-Atlantic superliner. It will equal approximately 4 pct of total displacement.

# INDUSTRIAL SHORTS

**Warehouse Opened** — FOLLANSBEE STEEL CORP. has opened its new Pittsburgh warehouse, which included 100,000 sq ft of floor space and modern handling facilities. The company has added hot-rolled plates, bars, and shapes to its warehouse line.

**Latrobe Moves** — To expedite service to customers, the LATROBE ELECTRIC STEEL CO. is moving its Chicago branch office and warehouse to its newly built quarters at 2006 N. Hawthorne Ave., Melrose Park, Ill.

**Miles of Pipe**—Texas Eastern Transmission Corp., has awarded WILLIAMS BROS.-DAVIS CO., a contract for construction of 163.6 miles of 30-in. pipe line from Kosciusko, Miss., to the Tennessee river.

**At New Address**—The offices of the Cleco Div. of the REED ROLLER BIT CO., in Philadelphia, are now located at 5200 N. 5th St., Phila.

**Service Award**—Frank L. O'Brien. Sr., president of the O'BRIEN MACHINERY CO. was awarded a certificate for over 50 years of service in the electrical industry at the 13th annual meeting of the National Industrial Service Assn. in San Antonio, Tex.

**A First** — Four gas turbine power plants, first to be installed in the State of Connecticut, will be placed in service early in 1953 by the Connecticut Electric Light & Power Co. The order for the gas turbine units has been placed with the GENERAL ELECTRIC CO.

**Canadian Coverage** — Canadian Westinghouse Co., Ltd., Hamilton, Ont., will handle the WESTINGHOUSE AIR BRAKE CO.'S line of industrial air compressors and pneumatic controls for oil rigs, marine vessels and general industrial applications.

**Reactivation**—THE NATIONAL ASSN. OF WASTE MATERIAL PRODUCERS has been reactivated to promote the interests of its members and to represent them before the Office of Price Stabilization. All industrial scrap producers are eligible for membership.

**Contract Awarded**—THE UNITED ENGINEERING & FOUNDRY CO., Pittsburgh, has been awarded a contract from U. S. Steel Co. for a 30-in. 6-stand continuous vertical and horizontal billet mill and a 21-in. 4-stand continuous vertical and horizontal billet mill. These are for the Fairless Works, located near Morrisville, Pa.

**Starring Nell** — Completion of its second motion picture within 3 years aimed at freight loss and damage prevention has been announced by UNION PACIFIC RAILROAD. Entitled "Do Right by Our Nell", the new picture is a 16mm sound-color film with a running time of 33 minutes.

**Pittsburgh Office**—The Yoder Co., manufacturers of cold-rolled forming, slitting and tube mill machinery, opened a sales office in the First National Bank Bldg., Pittsburgh.

**Removal Notice**—The company of J. ARTHUR DEAKIN & SON, national representatives of George H. Alexander Machinery, Ltd., have moved to 150-28 Hillside Ave., Jamaica, N. Y.

**Further Expansion** — RYAN AERONAUTICAL CO., San Diego, Calif., has started construction of a 75,000 sq ft addition to its manufacturing facilities, providing production space for their jet engine program.

**Furnace Sales Outlet** — LINDBERG ENGINEERING CO., manufacturers of heat treating furnaces and melting furnaces are opening a direct factory sales office in Atlanta.

sary equipment. Arrangements for the training of operating and supervisory personnel have been looked into.

All these plans, however, are necessarily on a tentative basis pending certification by the government that construction of the plant would further the defense effort.

IAC says it is not interested in obtaining a government loan. Discussions with Otis & Co., Cleveland, indicate that private capital will be available for construction and operation under government certification of loan. Operating capital beyond the initial equity of the two founder members of IAC is also being arranged. Chief reason for obtaining a certificate of necessity, says IAC, is to facilitate obtaining of needed materials and equipment. IAC also does not propose to take full advantage of quick amortization privileges.

IAC proposes that entire output of the plant be sold to General Services Administration for distribution to independent aluminum fabricators to use for defense orders.

### Not a White Elephant

Furthermore, IAC has told the government it can guarantee a peace-time market for the metal—that the plant would not be a white elephant should the defense program blow up. Two members of IAC's board of directors would represent the public to assure equitable distribution of metal.

IAC officials have made cost studies which indicate they will be able to sell the metal competitively. The Portland area would be the most likely location of the plant because of the availability of port facilities. There is a possibility that the alumina production unit would be located on the Gulf Coast, depending on the availability and cost of gas. This would considerably shorten the haul of bauxite.

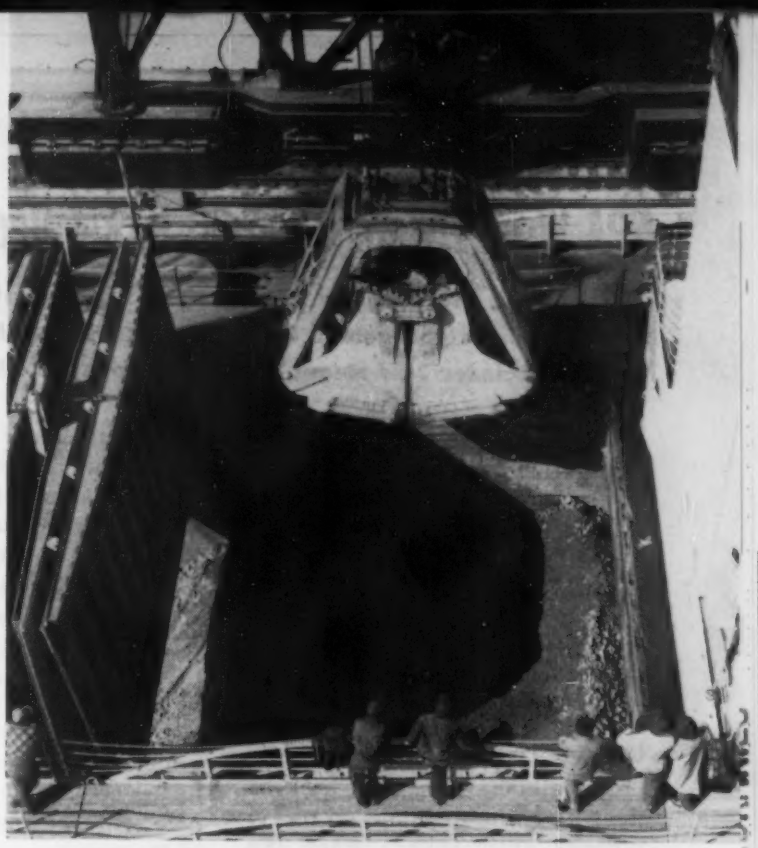
IAC estimates it would cost $30 million to construct the reduction plant, and $8 million for the alumina facilities.

# Foreign Ore to Flow Through B&O's New Pier

**Baltimore**—This is a gala week for the Baltimore and Ohio Railroad. It marks the formal opening of the B&O's new $5 million pier here designed especially to handle imported ore.

The new pier is capable of handling at least 10 million tons of ore per year. The ore unloading and handling facilities can unload a 30,000 ton modern ore vessel in 24 hr. This requires about 500 railroad cars loaded out at a rate of less than 3 min. per car. It can accommodate ships up to 40,000 tons.

A feature of the ore unloading and handling facilities, built by Dravo Corp., is the two buckets that lift ore from the ship's hold—15 tons at a bite. The conveyor belt, built by B. F. Goodrich Co., is the largest ever built in a single roll. Belt is 1812 ft long, 48 in. wide, weighs 45,000 lb and travels 400 fpm.



HOW IT WORKS: Photos at right show sequence of unloading operations. Ore is scooped out of ship's hold by huge 15-ton buckets (top). The buckets drop the ore into bins which feed it onto a conveyor belt (middle). Belt carries ore to scale-house where it is weighed automatically before it is deposited in railroad cars on tracks below (bottom).

First boat to unload at the pier was the S. S. Chilore of the Ore Steamship Co., a subsidiary of Bethlehem Steel. It carried 26,000 tons of high grade ore from Chile destined for furnaces at Bethlehem, Pa.

Opening ceremonies last Tuesday at the pier on Curtis Bay, Baltimore Harbor, were attended by a large gathering of prominent leaders from the steel, railroad and shipping industries. Brief talks were made by Governor Theodore R. McKeldin of Maryland, Mayor Thomas D'Alesandro of Baltimore, President S. Page Nelson of the Baltimore Assn. of Commerce, and Col. Roy B. White, president of the B&O.

As the ceremonies closed the electrically operated pier machinery was switched on by Mrs. White, wife of the B&O president.

The new pier is adjacent to the B&O's export coal pier. Railroad yards with a capacity of 1800 cars support operations of the two piers. Cars emptied at the coal pier are immediately available for loading with ore, thus eliminating lost time for turn-around movement.

Construction of the pier began in January 1950. It is 650 ft long and is designed so that it can be extended 600 ft more. This would accommodate two more unloading machines which could double the pier's capacity if needed.

# NPA Wrings Water from DO Nickel Requests

**Nickel users limited to 60 pct of DO requests for May . . . Civilians guaranteed their 15 pct quota . . . NPA to allocate remainder . . . Means complete allocation of critical nickel.**

**Washington**—The NPA directive to International Nickel Co. last week ordered the firm to (1) ship only 60 pct of the nickel called for in DO orders, (2) continue supplying 15 pct of the average monthly base period consumption on non-rated orders, and (3) reserve the rest for distribution by NPA.

### Keeps a Tight Rein

Officials say this is to keep as tight a rein as possible on nickel supplies until June 1 when the melt-sheet and processing program goes into effect. This requires reporting of melt-sheet schedules together with an account of quantity, location and intended uses of unscheduled nickel supplies. It enables NPA to shift stocks from one user to another, temporarily or otherwise, whenever it seems necessary. In effect, it amounts to complete nickel allocation.

NPA recognizes the possibility that "safety factors" in military and defense orders can be carried too far. Any water in defense requirements under CMP (steel, copper and aluminum) will be shaken out by making claimant agencies turn back any unused material and the agency intends to apply the same system to nickel.

The percentage reserved for direct NPA allocation will be used to fill in the needs of programs that are hurt by the 40 pct cut in DO supplies. The jet engine program is the biggest single user of nickel steels, each engine requiring two or three times as much of the metal as a reciprocating engine. This program may need extra supplies.

### Civilian Output, Too

Washington thinking is that, short of all-out war, the civilian economy must also be kept at high levels. This thinking has been helped along by a literal deluge of industry requests for enough nickel to maintain operations. Incandescent and fluorescent lamp, sterilizer, ophthalmic, fountain pen and pencil, and stainless steel utensil industries represent a cross-section of those who have already beaten paths to NPA's doorstep in the search for nickel.

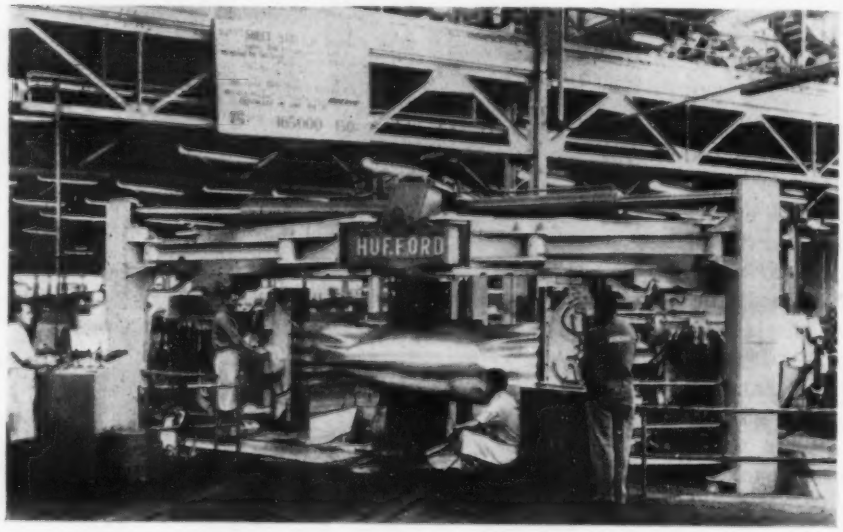
All of these industries, along with jet engine manufacturers and others, have instituted nickel saving practices through substitutions, elimination of unnecessary nickel in parts and redesign of parts.

### Production Plans

Inco, our sole source of nickel supply, is currently producing at a capacity rate of 10,000 tons a month and will boost that figure by another 500 tons per month before the year ends.

The company is caught, in a time of high demand, with no surface ore reserves and by 1953 will be mining all of its ore underground. Even so, an increase in ore production is planned, with Inco expecting to haul out 13 million tons of ore in 1953 as compared to 9.8 million tons produced last year.

STRETCHES LIKE SKIN: A B-47 tail cone section is formed at Boeing Airplane Co., Wichita division. Stretching the sheet to shape is a Hufford Sheet Stretch Press fabricated at the National Supply Co.




## First Shipment of Liberian Ore on Way for Republic in May

**More than 50,000 tons of ore per year will arrive from Liberia.**

**Flemington, N. J.**—First results of Republic Steel Corp.'s campaign to match iron ore resources against its expanding steelmaking capacity will come this month when the initial shipment of Liberian iron ore arrives. By early 1952, two 23,000-ton ore carriers will be making the run a steady thing, reported T. M. Girdler, chairman of the board, at the annual stockholders' meeting held here recently.

### Competitive in Cost

He said more than 50,000 tons of Liberian ore per year would be going to Republic plants. The ore's high iron content will make its cost competitive with domestic ores.

Mr. Girdler said defense need for steel is growing and defense and its supporting programs are taking more than 50 pct of Republic output. He predicted that with

defense needs increasing, civilian steel shortages will continue into 1952.

In 1950 Republic added 267,000 tons of ingot capacity, in the coming year four new openhearths will add 672,000 tons of capacity at Cleveland, and by 1953 capacity will rise by 1,174,000 tons including the Cleveland growth, Mr. Girdler said. Capacity at completion of expansion will reach well over 10 million tons.

Expansion expenditures will be about $250 million. Last November, Republic obtained an agreement from General Motors to get periodic advances of up to $40 million to help meet the Cleveland expansion cost.

# Most Leave Contractors' Show Empty-Handed

**Small businessmen take first steps to land subcontracts . . . Have opportunity to sell plant facilities . . . Some lacking facilities to handle big jobs . . . Uncertainty a factor.**

Chicago—More than 10,000 small businessmen attending the Air Force Prime Contractors' Exhibit at Navy pier this week took the first step toward getting a subcontract—they met the primes' purchasing experts and engineers.

While many left the exhibit empty-handed, the lively group of businessmen spelled out for representatives of 80-odd prime contractors how their plants can fit into the overall defense production picture later.

Few walked away with contracts. Most attending recognized the difficulties of getting contracts, but were at the show to head off the shutdown they face 3 to 6 months from now when materials are no longer available for civilian production.

### Subcontract Obstacles

Chief obstacles in the way of getting subcontracts are:

(1) Many primes are using their own facilities to manufacture parts. Total machine time has not yet been taken up and they are not pushed to let out subcontracts.

(2) Many big projects normally calling for much subcontracting are still in the engineering and research stage. When they hit experimental and pilot production levels they will offer more opportunities.

(3) Tool making and building of new production facilities are only beginning. Big inventories of parts are a burden until needed for assembly.

(4) Some small firms do not have facilities to handle subcontracts. Many subcontractors are actually making involved components. Small plants may have neither the equipment nor experience to handle a big job involving large multi-department manufacturing. Many of these small businessmen will become subsubcontractors when orders start seeping down.

(5) Some primes have established subcontract sources. These are hard to buck. But prime contractors more and more are following a policy of spreading the work in order to guarantee a sure supply in any emergency.

(6) Uncertainty is a strong factor. Many subcontractors are hesitant. Businessmen are uncertain which side of the Korean see-saw will finally bump ground. But they do know that to survive they have to sell themselves and their plants as they did at Chicago.

Sponsored by the Midcentral Air Procurement District, the show brought together Air Force prime contractors and small industry. Parts, blueprints and photographs of items now being purchased by the Air Force were displayed. Engineering and purchasing personnel were on hand with requirements and specifications.

# BITS AND BRIEFS

By Bill Packard

Subcontracting is still the small firm's best bet for defense business. Prime contractors will need a lot of help later, but some small manufacturers are getting discouraged because subcontracts aren't coming as fast as they had been led to expect . . . **Officials of Sharon Steel and National Supply indicating merger negotiations are not now underway. Sharon buying National stock revived the rumor** . . . National Malleable & Steel Castings Co. planning to spend $6.3 million within next year to boost capacity 25 pct. Plants at Cleveland, Chicago, Indianapolis, Sharon, Pa. and Melrose Park, Ill., will share, with malleable iron getting biggest boost . . . **New Viracle fabric getting big sendoff at Waldorf-Astoria is 55 pct Dacron (a DuPont synthetic) and 45 pct wool. First use will be in men's suits (Hart Schaffner & Marx at $79.50) which are said to hold crease after soaking in water** . . . Yale & Towne Mfg. Co. reporting sale of its industrial scale business to Detecto Scale, Inc., E. F. Twyman, Y&T vice-president, says this will permit concentration of more machines and manpower on production of defense orders for industrial trucks and hoists . . . **United Lacquer Mfg. Corp. pushing colored lacquer which is sprayed or dipped on steel to provide a substitute for scarce brass and bronze. Firm admits the substitute has its limitations but says it is being used for hardware, lamps and fixtures. Lacquer dries in 10 to 15 min.** . . . Atlantic Steel Co. celebrating its 50th anniversary. Board Chairman Charles Stone marking the occasion by authoring "The Story of Dixisteel" which covers history and growth of company during its first 50 years . . . General Motors setting another alltime high for first quarter sales. But net was lower because of record taxes—nearly a quarter of a billion dol-

lars . . . **Washington officials have raised their estimate of steel under CMP to more than 50 pct of production. They are getting closer to our prediction that 75 pct of steel output will be controlled by the fourth quarter** . . . Baltimore and Ohio public relations people winning applause from industry and press for fine job of arranging accommodations and publicity for opening of B&O's new ore pier at Baltimore. The pier will handle imported ore.

# CMP Issues Inventory, Distribution Orders

**Reg.'s 2 and 4 set up basic CMP requirements . . . NPA prepares directive system for channeling steel output . . . Third quarter steel allocation program may be implemented.**

**Washington**—Taking another step toward starting CMP, NPA last week began setting up a directive system within its Iron & Steel Div. These will direct manufacture of steel into required shapes and forms.

Orders were being drawn up for issuance early this week, directing the July flow of carbon steel into defense and essential programs. The lead time for orders on July production was to be reduced from 45 days to 30 days.

At a meeting of the Steel Products Industry Advisory Committee, NPA re-affirmed its belief (THE IRON AGE, May 3, p. 93) that steel set-asides for allocation will exceed 50 pct of ingot output. It will run much higher than 50 pct for some products, including structural steel, plates, tubes, and alloy steels.

Because of the necessity of channeling steel into construction of new steel and aluminum facilities, the NPA said, the percentages of set-asides, overall and for individual types, will probably be increased for August.

### Extend Allocation Program

Atop CMP Reg. 2 and Reg. 4, issued this week to govern steel, aluminum and copper inventories and distribution, came another move to implement and extend the allocation program for steel in the third quarter. (See p. 112.)

Components and industrial machinery, in addition to direct defense and defense supporting programs, will come under the broadened allocation base, it is reported.

The program is expected to hasten establishment of CMP regulations for the third quarter. Normally allocation could not be made until manufacturers reported requirements to NPA, about the end of this month. This would prevent NPA from giving firm steel allocations in time for July or August delivery.

Allocations for some defense supporting programs such as freight cars are expected to be cut from the June level.

According to NPA 50 pct of the steel supply will go to defense and defense supporting programs in July. Steelmen feel this is an optimistic figure and the percentage of finished steel used may go higher. (See THE IRON AGE, Apr. 19, p. 15).

Under CMP 2, inventories of steel shapes and forms must not exceed amounts necessary to meet deliveries or operations, at the current rate, for the succeeding 45 days.

In the case of structural shapes, the purchaser is forbidden to take delivery more than 45 days ahead of fabricating or assembly time. A 60-day ceiling is imposed on aluminum and copper.

Acceptance above ceiling is permitted in some cases: If a producer has shipped controlled materials prior to receipt of orders to cancel, reduce or postpone a shipment. This applies to imports under some conditions.

Where a user's inventories are top-heavy, he may not accept domestic shipments until inventories are reduced. The order has aimed at encouraging users to find foreign supply sources.

Excess inventories are, in most cases, subject to curtailment or requisition.

### Who Isn't Distributor

Buyers of controlled materials for resale who do not take actual delivery are not regarded as distributors. Nor are those who cut to size, thread, sort or grade the materials considered fabricators.

Under CMP 4 a distributor must accept all authorized orders, that is, those bearing an allotment number or symbol; orders bearing a DO rating; and other delivery orders for controlled materials in the quantities and conditions set forth in orders M-5, M-6, and M-11.

He may reject orders not for immediate delivery, but, if accepted, cannot set aside stocks to fill the order at a later date.

"We always did have a bit of a shipping problem."

## Ferrous Casting Shipments Up

**Washington**—Shipments of ferrous castings and the backlog of unfilled orders showed a continued rise during January.

**Shipments, thousands of tons:**

| | Jan. 1951 | Dec. 1950 | Jan. 1950 |
|---|---|---|---|
| Gray iron | 1,364.0 | 1,182.0 | 913.0 |
| Malleable iron | 92.5 | 91.5 | 62.5 |
| Steel | 174.0 | 155.0 | 89.0 |

**Unfilled orders, thousands of tons:**

| | Jan. 1951 | Dec. 1950 | Jan. 1950 |
|---|---|---|---|
| Gray iron | 2,297.7 | 2,012.5 | 914.2 |
| Malleable iron | 234.1 | 195.0 | 62.3 |
| Steel | 6,785.4 | 554.2 | 142.5 |



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## NCA's Try for Labor Harmony; Informal Meetings with Union Men

**New York**—Management and union leaders have long been accustomed to meeting only for periodic squabbles on wages and fringe benefits. Usually the mood of the meetings was not one conducive to the feeling of friendship and a sense of partnership in production.

Now the National Constructors Assn., comprising firms building steel mills, chemical plants, and oil refineries, have taken a new tack in labor relations. They announced a new policy of inviting national officers of unions to association meetings in different cities.

The invitations have no strings attached. Their purpose is not to make labor people advocates of management policy. No specific problems are to be thrashed out but the policy will lay the groundwork for "intelligent negotiation and agreement later."

## Ford May Buy Near Irvin Works

**Pittsburgh**—Ford Motor Co. is reported negotiating for purchase of a 10-acre site near the Irvin Works of U. S. Steel Co. Indications are the company plans to erect a parts depot to replace an 8-floor building in Pittsburgh recently sold.

The activity has aroused speculation that Ford may be considering construction of a production plant. This would be in keeping with Ford's program of decentralization, apparent in the construction of a forge plant at Canton, Ohio, a stamping plant at Buffalo, and foundry at Cleveland.

## Construction Contracts Rise

**New York**—An 8 pct increase in construction contracts awarded in April for 37 states east of the Rocky mountains has been recorded by F. W. Dodge Corp. The April figure was $1,374,991,000 compared with the March total of $1,267,450,000. Contracts awarded in April, 1950, totaled $1,350,496,000.

## Keeping Pace With the Customer

**New York**—Ferroalloy production must go hand in hand with the iron and steel industry up the ladder of expansion. Electro Metallurgical Co., a division of Union Carbide & Carbon, has long recognized this. By 1953 the firm will have put the finishing touches on its growth project. Now producing more than 50 different alloys and metals for iron, steel, and some nonferrous metals, Electromet will in 1953 have increased its ferroalloy capacity by more than 200 pct since 1940.

In the postwar period alone, Electromet is spending about $135 million. It is building its newest plant at Marietta, Ohio, where electric furnace and power plants will be producing this summer. On blueprints is other construction at Ashtabula, Ohio, and Portland, Ore., plants.

One of the prime reasons for expansion, says Electromet, is the "growing demand for alloy steels." Output of high-quality war steels increased to 13 million tons in 1943—while 1940 production was only 5 million tons. Alloy steel output last year was above 8 million tons, a boost of 60 pct over prewar production.

Electromet expects to produce substantial quantities of its new extra-low-carbon ferrochrome for making stainless steel at the Marietta plant.

*In the Picture: Towering up to three stories high, smelting furnaces producing alloys get ore, coke, and other raw materials at the top. Molten alloy is drawn from a tap hole at the bottom of the electric furnace.*

## French Steel Prices Increased

**Paris**—French steel prices were increased recently from 18 to 24 pct. It is possible this increase may reach 30 pct, a figure the steel industry has requested.

## British Scrap Costs Go Up

**London**—British steelmakers are paying from 41¢ to 83¢ more per long ton for scrap steel. The increases reflect recent higher freight rates.

## Industry Controls This Week:

**NPA Orders**

M-3, Columbium, Tantalum—Amendment revises restriction to step up output of alloy steels. Effective May 11, 1951.

M-45, Polyethylene — Provides for allocation of polyethylene as a B material. Effective May 11, 1951.

M-55 A, Farm Machinery—Permits farm equipment makers to use DO-87 to obtain third quarter materials. Effective May 14, 1951.

M-60, Component parts — Interim order guarantees third quarter materials for defense and essential civilian production of small tools and supplies. Effective May 14, 1951.

M-61, Machine tool materials—Authorizes use of DO-75 to obtain third quarter steel, aluminum and copper for machine tool makers. Issued May 14, 1951.

CMP Reg. 2, Inventories—Limits inventories of controlled materials. Issued May 10, 1951.

CMP Reg. 4, Distribution — Describes rules under which distributors make deliveries of controlled materials. Issued May 10, 1951.

**OPS Orders**

CPR-31, Imports—Sets price controls on imports other than those essential to military and civiiian needs and strategic materials. Effective May 9, 1951.

## Survey to Check DO-97 Use

**Washington**—A 4-week survey of 800 industries and trades began Monday, May 14, by the NPA compliance division, to find out the degree of compliance or noncompliance with NPA Reg. 4, the MRO order.

## Revise M-3 to Speed Output

**Washington**—In an amendment to M-3, NPA last week revised restrictions on columbium and tantalum in order to step up output of steels using these materials.

Under the order, prior to this week, a ratio of eight parts to one of carbon was required except for certain types of defense orders.

The amendment continues the restriction except where an order requiring the higher ratio does not constitute a full heat lot. In such cases, enough additional steel may be included to make a full heat lot even though the extra steel is not under order.

The amendment also exempts from the restrictions the completion of production and delivery of orders received and accepted prior to Apr. 6.

## Firms Losing in Price Freeze Now Can Seek Profitable Prices

**Washington** — Office of Price Stabilization offered an "out" last week to manufacturers operating at an over-all loss because of price restrictions.

A new regulation (General Overriding Regulation 10) takes care of manufacturers who cannot operate under price-freeze orders without suffering an overall loss on operations.

To qualify for relief under GOR 10, a manufacturer must show that his loss results from ceiling price limitations and not from seasonal or non-recurring factors or uneconomical operations.

Any adjustments made in prices under GOR 10 must conform generally with prices of similar items sold by other manufacturers, OPS warned.

Manufacturers seeking relief must write to OPS. If OPS takes no action within 30 days after acknowledgment, the applicant may sell at his proposed price until otherwise instructed.

## M-61—Machine Tool Materials

**Washington**—In a new order, M-61, NPA authorized manufacturers of machine tools and related equipment, including rolling mill and foundry machinery, to use a priority rating, DO-75, to obtain steel, copper and aluminum during the third quarter.

Some 30 classes of equipment are included in list A for which the priority may be used to obtain specified percentages of the base period rate. The base period is set as first quarter 1951.

## Washington Weighs Allocations Of Pig Iron, New Ceiling Prices

**Washington** — The government started attacking the country's pig iron problems on two fronts last week. NPA started picking a task group to make recommendations for pig iron allocations in the third quarter. Meanwhile, OPS was considering setting new ceiling prices on merchant pig iron.

NPA's task group move was motivated by complaints of smaller foundries that their inventories are shrinking and there is no hope for improved supplies later. Part of the blame for the poor supply was put on steel mills, reportedly using greater tonnages of pig to compensate for less scrap available.

OPS officials are in touch with industry representatives on the advisability of issuing a regulation to roll back pig iron prices to pre-Korea levels plus labor and cost increases since then. The rollback would follow the pattern set in the OPS ceiling price regulation, CPR 22.

OPS metals consultants admit that application of this method could result in roll-forwards as well as rollbacks.

## Keeping Up to Date

**Washington** — A weekly bulletin, *Defense Production Record*, has been introduced by DPA to explain the week-to-week working of DPA as it affects business.

Businessmen may obtain the bulletin from the Superintendent of Documents, Washington 25, D. C., at a subscription rate of $2.50 per year. Single copies are 5¢. *The Record* is free to publications.

Copies of latest NPA and OPS orders may be obtained from field and district offices and directly from Washington.

To get on the Washington mailing list for NPA and CMP orders, address the U. S. Dept. of Commerce, Div. of Printing Services, Washington 25, D. C.

Copies of OPS orders may be

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obtained from the Office of Price Stabilization, Tempo E Bldg., 4th St. and Administrative Drive, S.W., Washington 25, D. C.

## Domestic Tungsten Mining Given Helping Hand by $63 Price

**Washington**—Expansion of domestic tungsten mining was encouraged last week when the General Services Administration set up machinery to guarantee a floor price of $63 a short ton for domestically mined concentrates for the next 5 years.

Funds are already available to allow GSA to purchase nearly 1,500,000 tons. But the agency does not expect that it will have to take actual possession of much of the concentrates.

The Defense Minerals Administration intends to aid in the establishment of new and expansion of existing milling facilities.

## DEFENSE CONTRACTS

Week of May 14, 1951

**Machine tools**—Bridgeport Machines, Inc., Bridgeport, Conn.
**Recording equipment**—Consolidated Engineering Corp., Pasadena, Calif.
**Engine lathes**—Lodge & Shipley Co., Cincinnati.
**Engine lathes** — Sidney Machine Tool Co., Sidney, Ohio.
**Pump, priming**—The Nash Engineering Co., South Norwalk, Conn.
**Pump, airconditioning**—Warren Steam Pump Co., Warren, Mass.
**Motor generators** — Continental Electric Co., Newark, N. J.
**Pulse generators** — Harvey-Wells Electronics, Inc., Southbridge, Mass.
**Range finder**—Otis Elevator Co., New York.
**Heaters**—Edwin L. Wiegand Co., Pittsburgh.
**Sleeve bearings** — Wakefield Bearing Corp., Wakefield, Mass.
**Log speed indicators**—Pacific Div. of Bendix Aviation Corp., Burbank, Calif.
**Concrete mixer**—Chain Belt Co., Los Angeles.
**Range, oil**—The Viking Mfg. Corp., Cleveland.
**Generator sets**—Stewart and Stevenson Services, Inc., Houston.
**Generator sets**—Caterpillar Tractor Co., Peoria, Ill.
**Radio transmitters**—Cellins Radio Co., Cedar Rapids, Mich.
**Transformers** — McGraw Electric Co., Milwaukee.
**Grinding machines**—Cosa Corp., New York.
**Roller bearings** — Norma-Hoffman Bearings Corp., Stamford, Conn.

*Turn Page*


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## Controls Digest *Continued*

**Helicopter spare parts**—Piasecki Helicopter Corp., Morton, Pa.
**Cameras**—Bell & Howell Co., Chicago.
**Turbochargers**—Pneumatic Tire Service Co., Huntington Park, Calif.
**Indicators**—Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.
**Adding machines**—Victor Adding Machine Co., Dayton.
**Mechanical press**—Verson All Steel Press Co., Chicago.
**Spare parts**—Bendix Aviation Corp., N. Hollywood, Calif.
**Lathes, engine**—The American Tool Works Co., Cincinnati.
**Machine tools** — Lucas Machine Div., New Britain Machine Co., Cleveland.
**Radio set**—Federal Telephone & Radio Corp., Clifton, N. J.
**Motor generator**—Homelite Corp., Port Chester, N. Y.
**Tool equipment**—Cooper & Cooper, Chicago.
**Radio set**—Raytheon Mfg. Co., Waltham, Mass.
**Tractors**—Minneapolis-Moline Co., Minneapolis.
**Tractors**—International Harvester Co., Melrose Park, Ill.
**Sniperscopes**—The Herman Body Co., St. Louis.
**Parts**—Wallace Tiernan, Belleville, N. J.
**Parts**—GMC United Motor Service, Detroit.
**Parts**—Industrial Engine & Parts, Chicago.
**Parts** — American Bosch Corp., Springfield, Mass.
**Parts**—Highway Trailer Co., Egerton, Wis.
**Parts**—Hercules Motor Corp., Canton, Ohio.
**Parts**—Pierce Governor Co., Anderson, Ind.
**Parts**—Marlin-Rockwell Corp., Jamestown, N.Y.
**Parts**—Westerlin & Campbell Co., Chicago.
**Parts**—Koehring Co., Milwaukee.
**Parts**—Lima Shovel & Crane Div., Baldwin-Lima-Hamilton Corp., Lima, Ohio.

## NPA Controls Mining Machinery

**Washington** — NPA has taken control over manufacture and distribution of mining machinery from the Interior Dept.

The switch was necessary to schedule production of mining machinery under CMP, NPA said. However, Interior Dept. continues to have power to determine mining industry requirements as to manpower, transportation, maintenance, repair and operating supplies.

## To Revise Aluminum Scrap Order

**Washington**—NPA is rewriting its aluminum scrap order (M-22) to promote the flow of scrap to fabricators of wrought products.

Independent fabricators are not now receiving enough scrap and are forced to turn to the primary product, NPA said. A revised definition of "independent fabricator" is being drafted.

## Farm Equipment Materials OK'd

**Washington** — Farm equipment manufacturers have been authorized to apply a DO-87 rating to obtain steel, copper, aluminum and component parts during the third quarter for all equipment given in schedule 1 of M-55A.

However, manufacturers may extend the ratings only to regular suppliers with whom they have dealt during the previous 2 years. An order may be placed with a new supplier only if the regular supplier fails to accept the rated order.

## STEEL PRODUCTION (Ingots and Steel for Castings)

As Reported to the American Iron & Steel Institute

| | Openhearth | | Bessemer | | Electric | | Total | | Calculated | No. Weeks |
|---|---|---|---|---|---|---|---|---|---|---|
| 1950 | Net Tons | Pct Cap. | Net Tons | Pct Cap. | Net Tons | Pct Cap. | Net Tons | Pct Cap. | Net Tons Weekly | in Month |
| Jan. | 7,136,227 | 98.6 | 379,252 | 80.6 | 426,318 | 73.0 | 7,941,797 | 94.0 | 1,792,731 | 4.43 |
| Feb. | 6,145,634 | 92.1 | 255,585 | 60.2 | 401,833 | 76.2 | 6,803,032 | 89.2 | 1,700,758 | 4.00 |
| Mar. | 6,750,884 | 91.3 | 265,726 | 56.5 | 481,212 | 82.4 | 7,497,822 | 88.6 | 1,692,511 | 4.43 |
| 1st Qtr. | 20,032,745 | 93.4 | 900,543 | 65.9 | 1,309,383 | 77.3 | 22,242,651 | 90.7 | 1,729,600 | 12.86 |
| Apr. | 7,318,720 | 102.3 | 407,909 | 89.5 | 497,875 | 88.1 | 8,224,504 | 100.6 | 1,917,134 | 4.29 |
| May | 7,601,880 | 102.9 | 437,006 | 92.9 | 525,321 | 90.0 | 8,564,207 | 101.4 | 1,933,230 | 4.43 |
| June | 7,222,185 | 100.9 | 406,944 | 89.3 | 514,101 | 90.9 | 8,143,230 | 99.6 | 1,898,189 | 4.29 |
| 2nd Qtr. | 22,142,785 | 102.0 | 1,251,859 | 90.6 | 1,537,297 | 89.7 | 24,931,941 | 100.5 | 1,916,367 | 13.01 |
| 1st 6 Mos. | 42,175,530 | 97.7 | 2,152,402 | 78.3 | 2,846,660 | 83.5 | 47,174,592 | 95.7 | 1,823,525 | 25.87 |
| July | 7,224,306 | 97.0 | 380,317 | 79.8 | 478,299 | 79.7 | 8,082,922 | 94.8 | 1,828,715 | 4.42 |
| Aug | 7,318,908 | 98.0 | 405,118 | 84.8 | 518,148 | 86.1 | 8,242,174 | 98.5 | 1,860,536 | 4.43 |
| Sept. | 7,262,359 | 100.7 | 409,216 | 88.7 | 533,422 | 91.7 | 8,204,997 | 99.4 | 1,917,055 | 4.28 |
| 3rd Qtr. | 21,805,573 | 98.6 | 1,194,651 | 84.4 | 1,529,869 | 85.8 | 24,530,093 | 96.9 | 1,868,248 | 13.13 |
| 9 Mos. | 63,981,103 | 98.0 | 3,347,053 | 80.4 | 4,376,529 | 84.3 | 71,704,685 | 96.1 | 1,838,582 | 39.00 |
| Oct. | 7,734,714 | 103.6 | 436,835 | 91.5 | 581,137 | 96.6 | 8,752,686 | 102.4 | 1,975,778 | 4.43 |
| Nov. | 7,111,829 | 98.4 | 370,659 | 80.1 | 540,905 | 92.8 | 8,023,393 | 97.0 | 1,870,255 | 4.29 |
| Dec. | 7,434,863 | 99.8 | 380,011 | 79.8 | 540,437 | 90.0 | 8,355,311 | 98.0 | 1,890,342 | 4.42 |
| 4th Qtr. | 22,281,406 | 100.6 | 1,187,505 | 83.8 | 1,662,479 | 93.1 | 25,131,390 | 99.2 | 1,912,587 | 13.14 |
| 2nd 6 Mos. | 44,086,979 | 99.6 | 2,382,156 | 84.1 | 3,192,348 | 89.4 | 49,661,483 | 96.0 | 1,890,426 | 26.27 |
| Total | 86,262,509 | 98.7 | 4,534,558 | 81.3 | 6,039,008 | 86.5 | 96,836,075 | 96.9 | 1,857,232 | 52.14 |
| 1951[2] | | | | | | | | | | |
| Jan. | 7,844,982 | 101.4 | 431,725 | 90.4 | 566,460 | 88.3 | 8,843,167 | 99.9 | 1,996,200 | 4.43 |
| Feb. | 6,935,512 | 99.3 | 326,112 | 75.6 | 504,077 | 87.0 | 7,765,701 | 97.1 | 1,941,425 | 4.00 |
| Mar.[1] | 8,059,625 | 104.2 | 408,926 | 85.6 | 602,504 | 93.9 | 9,071,055 | 102.4 | 2,047,642 | 4.43 |
| 1st Qtr.[1] | 22,840,119 | 101.7 | 1,166,763 | 84.2 | 1,673,041 | 89.8 | 25,679,923 | 99.9 | 1,996,884 | 12.86 |
| Apr.[2] | 7,845,000 | 104.7 | 392,000 | 84.8 | 595,000 | 95.7 | 8,832,000 | 103.0 | 2,059,000 | 4.29 |

Note—The percentages of capacity operated (1951) are calculated on weekly capacities of 1,746,337 net tons open hearth, 107,806 net tons Bessemer and 144,891 net tons electric ingots and steel for castings, total 1,999,034 net tons; based on annual capacities as of January 1, 1951 as follows: Open hearth 91,054,020 net tons. Bessemer 5,621,000 net tons, Electric 7,554,630 net tons, total 104,229,650 net tons.

[1] Revised. [2] Preliminary.

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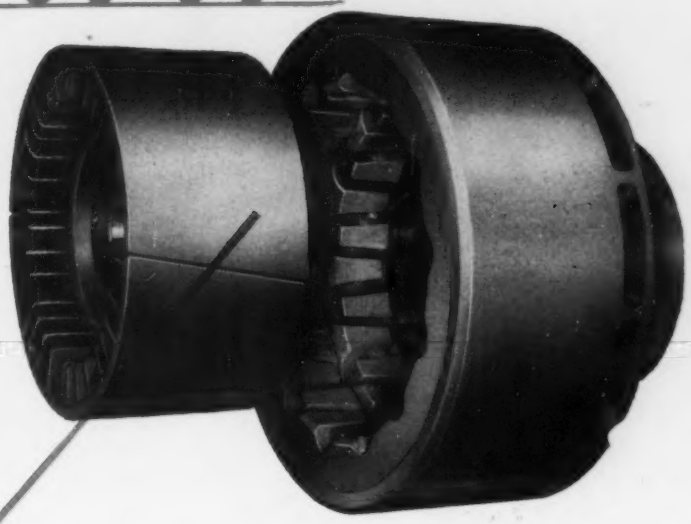

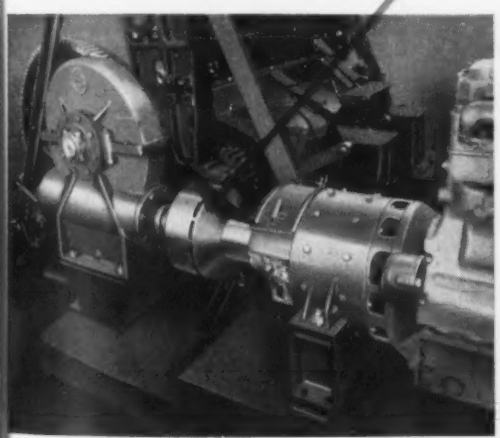

142-A

## For Smooth, Acceleration, and Control of Hoist, Rotating and Travel

The new, electrically operated DYNAMATIC CLUTCH, available as standard equipment only on Brownhoist Diesel Electric locomotive-cranes, provides a smooth, responsive flow of power never before possible with the usual disc or mechanical clutch for transmitting power to the machinery of a crane. The DYNAMATIC CLUTCH is essentially a driven rotor revolving on anti-friction bearings within a rotating coil energized by a small flow of current from the starting battery. The new DYNAMATIC CLUTCH has a 32-step control. Power response is steady and sensitive. Loads may be raised, lowered, or rotated smoothly and accurately without the use of mechanical brakes. Torsional impulse and vibration from the power source is completely eliminated. The DYNAMATIC CLUTCH provides a cushion between the engine and crane machinery. When clutch is fully engaged there is no appreciable slippage. Since there is no contact between the revolving field and armature, there is no friction between moving parts nor drag between the parts when the controller is in the off position — no parts need replacement other than inexpensive brushes. The new DYNAMATIC CLUTCH is one more good reason it pays to buy a BROWNHOIST.

BROWNHOIST

INDUSTRIAL BROWNHOIST CORPORATION • BAY CITY, MICHIGAN • DISTRICT OFFICES: New York, Philadelphia, Pittsburgh, Cleveland, San Francisco, Chicago, Canadian Brownhoist Ltd., Montreal Quebec. AGENCIES: Detroit, Birmingham, Houston, Los Angeles.

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for you and our Government !

Serious shortages exist in all types of scrap;
You can all help us by directing it back.
Select and collect all the scrap that you can
And sell it or give it to your local scrap man.
Vital production can then best be enrolled,
To bring quicker relief in these times of control.

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Give us a chance to offer a "cast steel" answer for your parts problem. Our suggestions while your product is in the design stage will pay continuous dividends. Write or call today. Unitcast Corporation, Steel Casting Division, Toledo 9, Ohio. *In Canada:* Canadian-Unitcast Steel, Ltd., Sherbrooke, Quebec.

UNITCASTINGS ARE FOUNDRY ENGINEERED


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# publications

*Continued from Page 35*

tures are shown to reflect quality and value which can be translated into higher performance, easier operation and lower maintenance. *Bay City Shovels, Inc.*

**For free copy insert No. 31 on postcard, p. 35.**

## Self-leveling ramps

The Globe self-leveling ramp, described in a new 4-p. folder, provides a firm, safe bridge between truck and loading platform—automatically compensates for truck spring compression or expansion—and saves time and cuts costs on loading or unloading operations. Photos of several installations are presented. Specifications and diagrams show construction and operation of the unit. *Globe Hoist Co.*

**For free copy insert No. 32 on postcard, p. 35.**

## TV-maker's facilities

In a new 8-p. illustrated brochure designed for the information of prospective military customers, Magnavox shows its four plants in Indiana, Kentucky, Tennessee and New York, its engineering, fabricating, assembling, testing and other production processes, and, in addition, some of the electronic, electro-acoustical and electro-mechanical products it has manufactured for the armed services. *Magnavox Co.*

**For free copy insert No. 33 on postcard, p. 35.**

## Metal stitchers

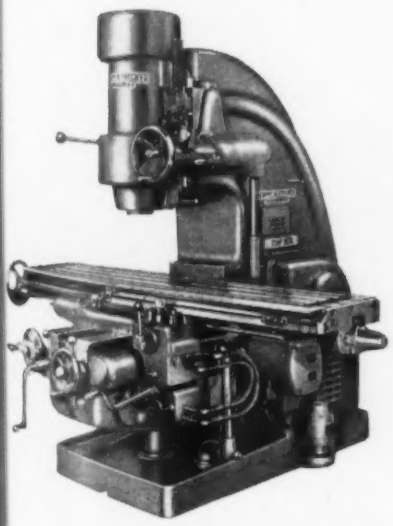
The Acme-Morrison metal stitcher, for high-speed economical fastening whenever metal is to be fastened to another metal or to nonmetallic materials, is described in a new 8-p. bulletin illustrating various light and heavy duty models. Examples of a few of the many stitchable combinations are shown, where the use of rivets, screws, nails and spotwelding were eliminated. Complete specifications are listed. *Stitching Wire Div., Acme Steel Co.*

**For free copy insert No. 34 on postcard, p. 35.**

*Turn to Page 124*

# ANNOUNCING

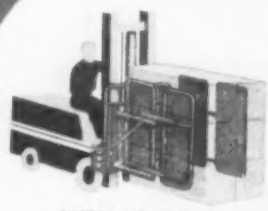
## The Addition of Vertical Style Milling Machines to the New KEARNEY & TRECKER MILWAUKEE CK Line

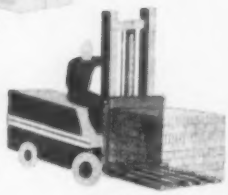


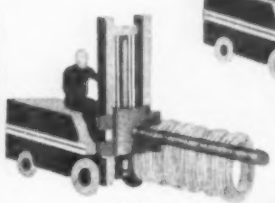
Kearney & Trecker's new CK line of Knee-Type Milling Machines is complete with Plain, Universal and now — Vertical styles. These new Vertical CK's have every feature of the CK line. Features that are job and test-proven — designed to fill today's immediate needs — and to meet your tomorrow's milling requirements. You'll find they have all the new CK cost-cutting advantages — Greater Rigidity, Greater Horsepower, Greater Cutting Efficiency, Greater Productivity, Greater Versatility, Smoother Feed Performance and Greater Machine Life. If you need a new vertical style knee-type mill—don't fail to investigate these new CK's. For without reservation, the new CK line of knee-type milling machines — Plain, Universal and Vertical — are the finest Kearney & Trecker has ever offered to the metalworking industry. Your choice of five sizes — 10 hp No. 2, 15 hp No. 3, and 25 hp Nos. 4, 5 and 6. Kearney & Trecker Corp., 6784 West National Avenue, Milwaukee 14, Wisconsin.

REPLACEMENT OF OBSOLETE MACHINE TOOLS
IS AN INVESTMENT THAT MAKES BOTH DOLLARS AND SENSE

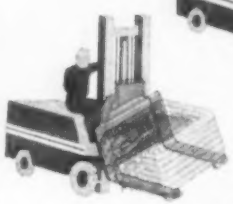
KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS


CARTON CLAMP

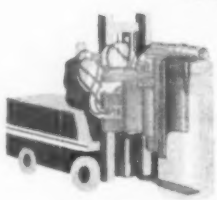

BRICK FORKS


RAM

CRANE


ROTATING DEVICE

SHOVEL


BARTEL DEVICE

CLAMP

# MORE FOR YOUR MONEY .....IN CLARK Attachments

You employ your fork-lift truck to best advantage by getting the most out of it. CLARK attachments for CLARK fork-lift trucks enable you to do just that.

Interchangeable in most cases with standard forks, these attachments make a fork-truck *many machines in one*—a truck out of which maximum rather than just normal benefits are derived. And all this at a cost so low that it is quickly and painlessly absorbed.

To make the most of your fork-lift trucks—to discover uses for them that might not have occurred to you, check with your CLARK Dealer (he's listed in the Yellow Pages of your telephone book) or fill out the coupon below and send it to us attached to your business letterhead.

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AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS


# *publications*

*Continued*

## Power bending brake

A new 12-p. catalog illustrates and describes the complete line of Chicago steel power bending brakes and power universal box and pan brakes. Besides complete specifications on all standard sizes of machines, the booklet gives details on the improved motor drive, the better clamping methods employed, and the easier and more accurate controls that simplify bending operations. Numerous illustrations show a wide variety of bending operations. A detailed description is given of how the different pieces are handled and approximate time required. *Dreis & Krump Mfg. Co.*

**For free copy insert No. 35 on postcard, p. 31.**

## Thermo-regulators

Illustrated with photos and cutaway drawings, a new 12-p. catalog provides useful information on precise and reliable temperature control and regulation. The H-B thermo-regulators and thermostats shown may be selected according to accuracy requirements from ±0.0005°F to ±0.10°F. The equipment described includes advanced design thermo-regulators, and the H-B multi-contact thermo-regulators with 3 to 14 operating contacts as well as more simple types. The range extremities are minus 35°F to 350°F. *H-B Instrument Co.*

**For free copy insert No. 36 on postcard, p. 31.**

## Valve catalog

A new 44-p. illustrated catalog describing the complete line of Ross valves lists hundreds of standard models and modifications, including straightway, 3-way, 4-way and 4-way 5 port units in various sizes of hand, foot, solenoid, pilot, remote control, cam, speed control, shut-off, quick exhaust and miscellaneous valves. Sectional views, installation data, and diagrams are shown. General reference data are given with an explanation of air valve operation and the difference between various types. *Ross Operating Valve Co.*

**For free copy insert No. 37 on postcard, p. 31.**

*Resume Your Reading on Page 30*

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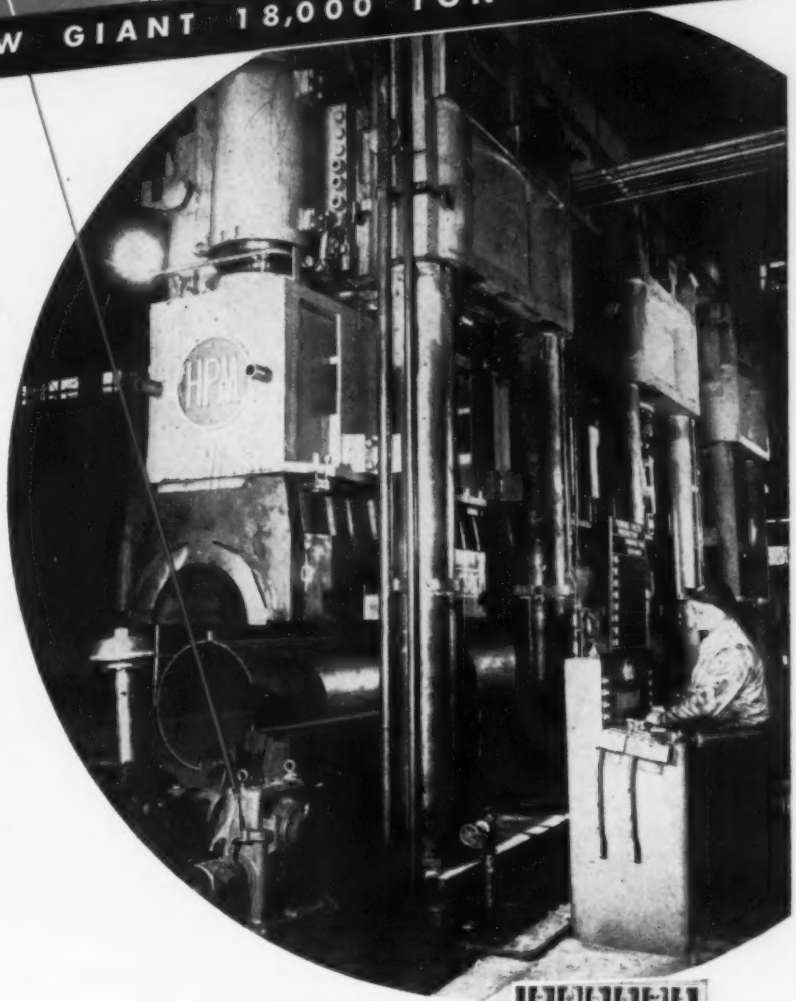
# 36" DIAMETER STEEL PIPE *IN A HURRY...*

## WITH H-P-M'S NEW GIANT 18,000 TON PRESS!




This giant H-P-M 18,000-ton press takes a 40½ foot long plate of ½ inch steel and forms it into a 36 inch diameter pipe at a production line rate. That's the role selected for two of these huge H-P-M presses now in production at National Tube, McKeesport, Pennsylvania, and Consolidated Western Steel, Orange, Texas.

The hundreds of H-P-M presses now serving the metal working industry have been selected because of their exclusive operational features: FASTRAVERSE hydraulic power system—quick, easy adjustment and control of press speeds, strokes and pressures—features that mean long die life and production with virtually no rejects.

Regardless of the size of your forming, drawing or stamping operations, there's an H-P-M press to improve your production. Call an H-P-M engineer for complete details.

HPM

**THE HYDRAULIC PRESS MFG. CO.**

1006 MARION ROAD - MOUNT GILEAD, OHIO, U.S.A.
Makers of Presses for the Metal Working and Processing Industries - Plastics Molding Presses - Die Casting Machines
Hydraulic Pumps, Valves and Power Units.

*Write for your free copy of Bulletin 5005 which completely describes H-P-M FASTRAVERSE and other special purpose H-P-M presses.*

HPM FASTRAVERSE METAL WORKING PRESSES

SERVING INDUSTRY THROUGH HYDRAULICS

# Speeding Rivet Production

According to production men, Keystone Tubular Rivet Wire has what it takes to increase production efficiency.

The special techniques and processing methods developed by Keystone have produced a tubular rivet wire with *exceptional* forming qualities for both extruded and drilled rivets.

The wire recommended for *drilled* tubular rivets has the proper hardness for longer drill life. The wire recommended for *extruded* rivets has uniform metal flow qualities required in extrusion headers. Both types have exactly the right ductility for cold heading and excellent roll crimping.

*Regardless of the performance demanded in your products, consult Keystone for the wire to meet your most exacting specifications.*

**KEYSTONE**
**STEEL & WIRE CO.**
SPECIAL ANALYSIS WIRE. SETTING NEW STANDARDS OF PERFORMANCE
**PEORIA ILLINOIS**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# *new equipment*

*Continued from Page 38*

## Lathe tool holder

A tool holder, known as the 10-in-1 tool holder, is constructed of heat-treated steel and features screw adjustment for tool height. Once adjusted, tools of the same type can be changed without disturbing the height adjustment. The holder is equipped with a self-aligning knurling head and a pair of medium diamond knurls. Coarse and fine diamond knurls; and coarse, medium, and fine straight pattern knurls are available. Boring tools, cutting-off blades and a set of four ground cutter bits are available for boring, cutting-off, turning, facing, and threading operations. *South Bend Lathe Works.*

**For more data insert No. 12 on postcard, p. 35.**

## Portable drill gun

For drilling high tensile steel, brick, glass, etc., a Desoutter electric drill gun is geared down to a low 450 rpm, has a capacity of 5/16 in. in steel and ⅝ in. in wood. Its 3-lb weight is accomplished through special design features that enable a full-sized, high-output motor to be accommodated in a relatively small space. The case fits the hand creating a direct line of thrust, making one-handed drilling a simple, less fatiguing operation. A natural - squeeze - action switch is lockable for continuous running. *Newage International, Inc.*

**For more data insert No. 13 on postcard, p. 35.**

## Hydraulic strainer

High pressure hydraulic strainers are designed to be placed in the line ahead of descaling spray nozzles, to enable the nozzles to operate at full efficiency and thus prevent scale streaks, product rejects and prolong the life of rolls, dies and forming equipment. The strainer consists of a series of machined bronze rings with grooved edges that are nested around a heavy slotted multi-ported bronze back-up cylinder and supported in a sturdy cast steel housing. Foreign particles of a size that would

# Be a wise bird about tubing

**Bundyweld** Tubing, double-walled from a single strip. Exclusive, patented beveled edge affords smoother joint, absence of bead, less chance for any leakage.

**Why get** yourself out on a limb with a tubing part that can't deliver the goods in your product?

Be like other wise birds and rely on Bundyweld . . . for lines that hold, come shaking or vibration, for coils that form right, or frames that are strong. The more stringent your needs, the better.

No other small-diameter tubing offers as much as this double-walled type of Bundy tubing. It's extra sturdy, won't leak under pressure or give under normal strain. It's thinner walled, conducts heat faster and fabricates with ease.

For details, just get in touch with headquarters for small-diameter tubing . . . today.

## Bundy Tubing Company

**DETROIT 14, MICHIGAN**

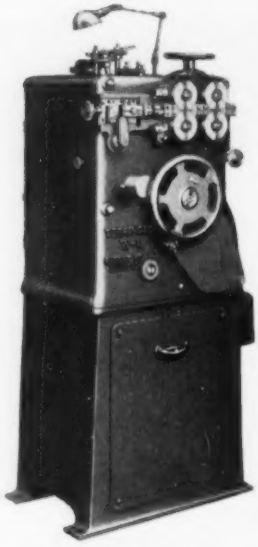
*World's largest producer of small-diameter tubing*

AFFILIATED PLANTS IN ENGLAND, FRANCE AND GERMANY

A very good solution to your spring problem. See the man with a

**Versatile Torrington Spring Coiler**

In spring coiling, the words "Torrington" and "Versatile" are synonymous! When you desire springs produced to meet exacting requirements, just call the professional springmaker who has a Torrington coiler. He's the man who can fill your needs with accuracy, speed and economy. On special springs, our sales department will gladly assist you in finding a source of supply, or help your springmaker devise just the right tooling to produce it.



MODEL W-11 SPRING COILER
The 14 different Torrington Spring Coilers cover a range of wire diameters from .003" to .750".

**SPECIFICATIONS**
**of the Model W-11 Spring Coiler**

Wire diameter range: .015" to .072"

Wire Length per Spring: 0" to 42" (Extra Wire Feed Gears Available)

Coil Range (O.D.): 3/32" to 1-9/16"

Production: 23 to 190 springs per minute with variable speed drive.

Torsion and other attachments are available.

The TORRINGTON MANUFACTURING COMPANY
TORRINGTON, CONNECTICUT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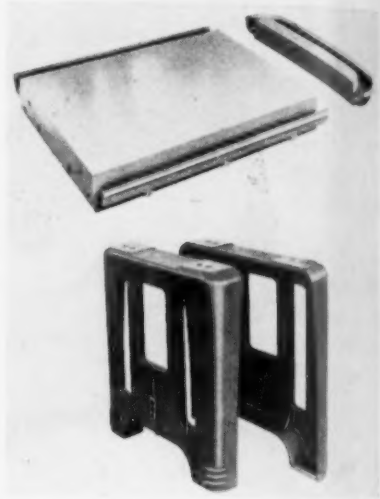
# *new equipment*

*Continued*

plug the orifices of spray nozzles are filtered out by the bronze rings. Strainers range from 1½ to 6-in. sizes for line pressures to 1500 psi. *C. B. Hunt & Son, Inc.*

**For more data insert No. 14 on postcard, p. 35.**



## *Sectional tables*

Low cost, rigid, sectional tables are available for setting up special purpose machines or multiple spindle drill presses to fit the job. Each section is 23⅜ in. wide x 30 in. long and with addition of the end sections, is increased to 35-in. length. Any length table can be built with these sections. Drain troughs carry off coolant on wet cutting operations. Each end section has a ¾-in. pipe tap for connecting to coolant system. Cast iron legs are available for mounting the table sections. *Delta Power Tool Div., Rockwell Mfg. Co.*

**For more data insert No. 15 on postcard, p. 35.**

## *Ring punches and dies*

The ring design of a standard line of ring piercing punches and button dies takes the place of the conventional punch head, providing better concentricity, permitting faster delivery from a wide variety of stock sizes. Ring punches are manufactured from carbon vanadium tool steel, uniformly hardened, and ground to meet the most rigid concentricity tests. Designed

# CECO-DROP

**The rapid striking action of the Ceco-Drop, the quick get-away of its ram after striking and the hammer's low center of gravity, insuring accuracy of die match, are some of the reasons why forge shops equipped with Ceco-Drops show increased production, more uniform accuracy and lower costs than with conventional gravity drop hammers.**

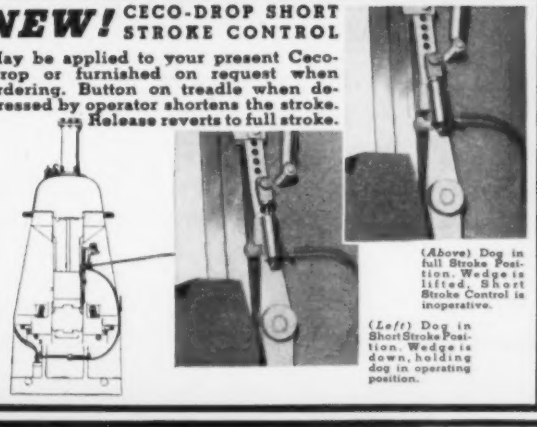
*Write for Bulletin 30-L-0*

## CHAMBERSBURG ENGINEERING CO.

**CHAMBERSBURG, PENNA.**

***NEW!*** **CECO-DROP SHORT STROKE CONTROL**

**May be applied to your present Ceco-Drop or furnished on request when ordering. Button on treadle when depressed by operator shortens the stroke. Release reverts to full stroke.**



(*Above*) Dog in full Stroke Position. Wedge is lifted. Short Stroke Control is inoperative.

(*Left*) Dog in Short Stroke Position. Wedge is down, holding dog in operating position.

# he's free of concern... his plant won't burn

Going home . . . relaxing after a day of high-geared activity is no trouble for this executive! His mind's at ease about fire . . . a short circuit, a stray spark, a forgotten cigarette or spontaneous combustion . . . all these and many more are definitely under control 24 hours a day, thanks to efficient, quick-acting C-O-TWO Fire Protection Equipment.

You, too, can have this same peace of mind . . . this same positive protection from costly fires by installing complete, approved C-O-TWO Fire Protection Equipment. For instance at many locations, with today's high costs and delayed replacements, a C-O-TWO Combination Smoke Detecting and Fire Extinguishing System is a "must." The first trace of smoke in a protected area sounds an alarm . . . then fast, clean, non-damaging, non-conducting carbon dioxide blankets the fire, putting it out in seconds, before it spreads and causes extensive damage . . . no after-fire mess, no water damage with carbon dioxide.

Also, C-O-TWO Portable Fire Extinguishers . . . either carbon dioxide type or dry chemical type . . . render fast, positive action for extinguishing fire during the incipient stage. C-O-TWO Portable Fire Extinguishers are designed to take abuse . . . rugged construction, no extra gadgets protruding or complicated operating parts . . . built to rigid specifications to assure you of lasting, efficient fire protection.

Remember . . . you can't put fire off . . . fire doesn't wait! For expert advice, let a C-O-TWO Fire Protection Engineer help you in planning complete and up-to-date fire protection facilities now. Write us today for complete free information . . . our experience is at your disposal.

TRADE MARK C-O-TWO REG. U.S. PAT. OFF.

**C-O-TWO FIRE EQUIPMENT COMPANY**

NEWARK 1 • NEW JERSEY

*Sales and Service in the Principal Cities of United States and Canada*

Affiliated with Pyrene Manufacturing Company

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

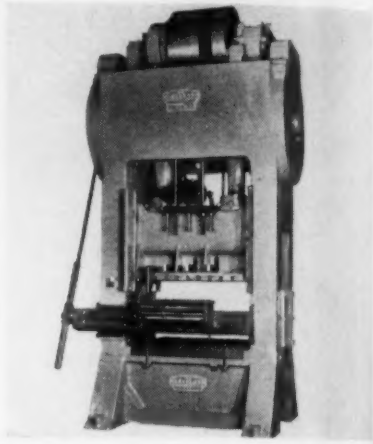
Squeez-Grip Carbon Dioxide Type Fire Extinguishers • Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-In Smoke and Heat Fire Detecting Systems


# *new equipment*

*Continued*

to avoid jamming and expensive downtime, new ring button dies are made with tapered hole, of the same steel as the ring punches. *Producto Machine Co.*

**For more data insert No. 16 on postcard, p. 35.**



## *Two point press*

A double geared, twin drive, two point press has an electrically controlled air-operated Cleveland drum type friction clutch with spring loaded brake. The press is equipped with a single roll feed and arranged with a pneumatic cushion in the bed. Stroke is 12 in.; adjustment of slide 8 in., distance bed to slide, stroke down adjustment up to 42 in.; bed area F to B x R to L 48x60 in.; area face of slide 42x60 in.; rpm 22; capacity 300 tons. *Cleveland Punch & Shear Works Co.*

**For more data insert No. 17 on postcard, p. 35.**

## *Boring head*

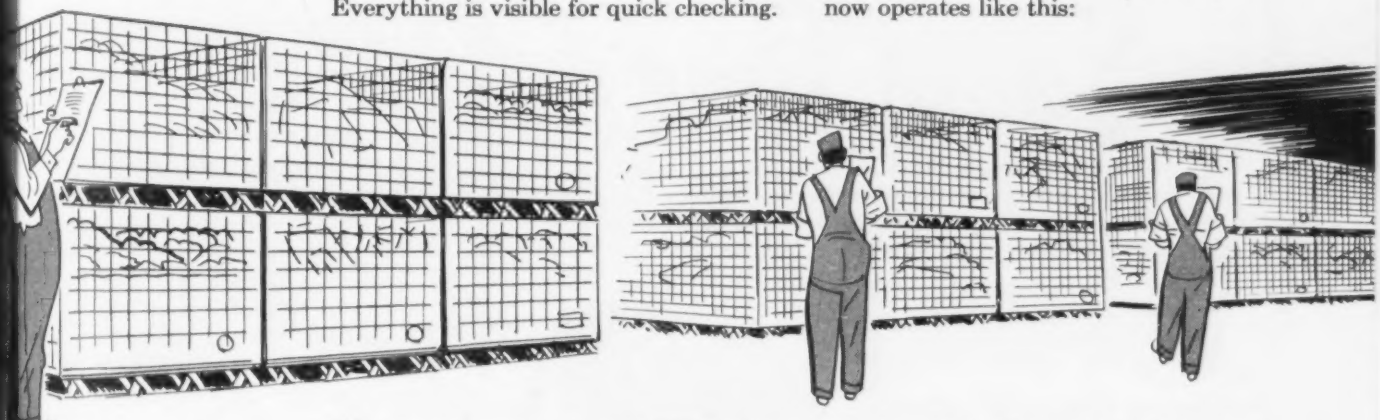
Larger body and block support dove-tail and increase rigidity of a new adjustable boring head. The tool handles rough and finish operations on boring, milling and drilling machines, and on automatics. Small and compact, it can be inserted easily and positioned rapidly. The adjusting head is graduated in 50 divisions to provide readings in thousandths, and the tool body contains graduations to permit vernier readings of 0.0002 in. The Series 50 boring head has a ⅜ in. minimum capacity with forged high speed steel bit and 7-

# nventory Was Tough In This Old-Time B.C.* Plant

★ Way back in the clumsy, wasteful days BC* (Before Cargotainers)—*the original, patented, palletized, welded wire containers*—this plant spent endless hours checking inventories. Even then, the results were often inaccurate because storage was neither visible nor efficient. The hubbub looked something like this:

# Then It Joined The A.C.* Trend

Somebody saw the light and now the plant has joined the AC* (After Cargotainers) trend. Vertical storage is smooth and easy and conserves floor space. Everything is visible for quick checking. Moreover, all materials and parts stay right in their rugged collapsible Cargotainers as they move to assembly line and shipment. This modern AC plant now operates like this:



If by some chance, you are still BC why not let a Pittsburgh Materials-Handling Engineer show you how other plants have saved man-hours and storage space and increased efficiency by joining the AC trend. Write today to Dept. IA, Pittsburgh Steel Products Company, Grant Building, Pittsburgh 30, Pa.

The Steel Industry Needs Scrap—*Keep it Moving*

# CARGOTAINERS

**by Pittsburgh Steel Products Company**

***A Subsidiary of Pittsburgh Steel Company***

# Kester Solder

Delicate fabrication or massive work, Kester makes a specialized flux-core solder (over 100,000 different types and sizes) that will do the job perfectly. Kester Solders are made only from the finest grades of tin and lead commercially available.

# Preferred

Kester Flux-Core Solders are not only preferred by industry, but individual workers also insist upon Kester to enable them to do their best work with a minimum of rejects.

# Saves Time

A Kester Technical Engineer, with his wide experience in industry, will specify the most efficient flux-core solder for your operation and will suggest the best method of application.

**Kester Solder Company**
4201 Wrightwood Ave., Chicago 39
Newark, N. J. Brantford, Canada

*Send for free manual "SOLDER and Soldering Technique"*

KESTER SOLDER

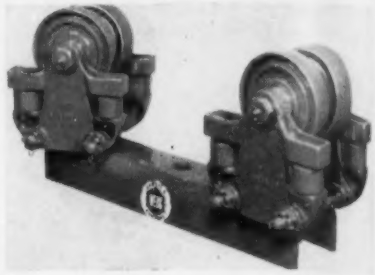
Standard for Industry since 1899


## new equipment

*Continued*

in. capacity with alloy steel bar with square bit. *Maxwell Co.*

For more data insert No. 18 on postcard, p. 35.



### Hand push trolley

For heavy loads and short radius curves, a new 6-in. hand push trolley has two two-wheel trolleys mounted on a steel load bar in such a manner that they can negotiate a minimum of an 18-in. radius curve. Side rollers prevent the trolley from binding on the I-beam when making a curve, and the use of ball bearings with ground races enables one man to push a ladle or any other load up to 1 ton with ease. Two of these trolley assemblies connected to a third load bar would permit handling a 2-ton load. *Jervis B. Webb Co.*

For more data insert No. 19 on postcard, p. 35.

### Diamond compound

A new diamond abrasive compound has been prepared especially for sizing and polishing carbide wire drawing and heading dies. Trade-named Dymo-C, it is claimed to cut 20 pct faster than diamond-olive oil mixtures when applied to carbide. It is delivered ready for use; no mixing is required. Advantages include convenience of application, resistance to drying out, deterioration or settling and uniformly precise grading of diamond particles. *Industrial Products Div. Elgin National Watch Co.*

For more data insert No. 20 on postcard, p. 35.

### Elevator-conveyer

Multiple manual handling of stampings can be eliminated with the use of a portable elevator-con-

*Turn to Page 134*

*Govan, Ferguson, Lindsay, Kaminker, Maw, Langley and Keenleyside, Architects*

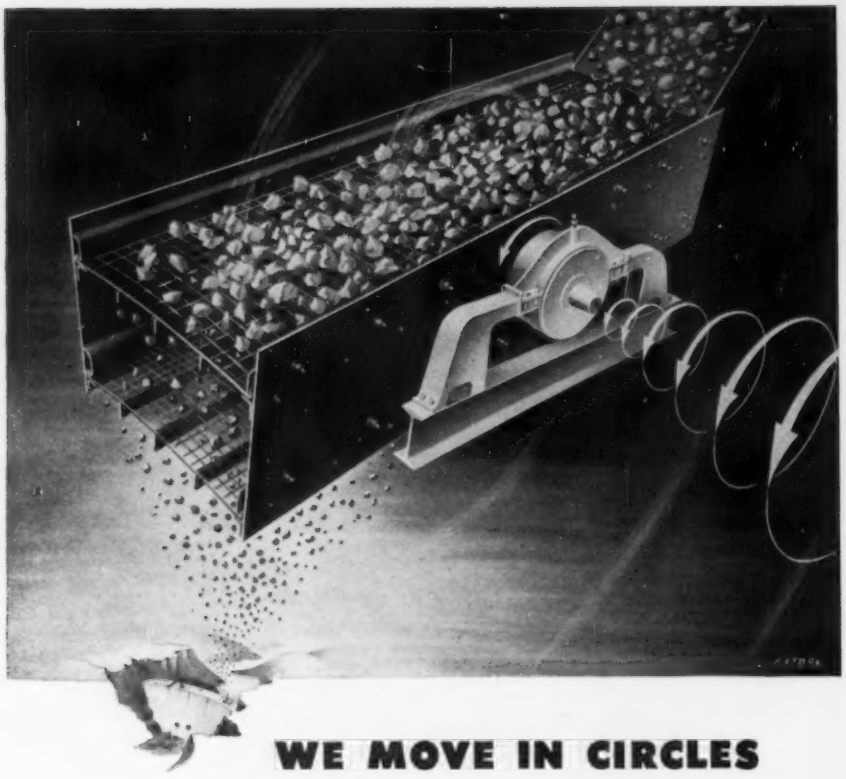
# THE HOSPITAL FOR SICK CHILDREN

## EQUIPPED FOR MODERN MIRACLES

**Stone & Webster Engineering Corporation was retained as Project Manager during the planning stage of the Hospital for Sick Children in Toronto and later supervised and directed the construction. This hospital provides the most modern facilities for the care of sick children and for medical research and instruction.**

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY OF STONE & WEBSTER, INC.



**WE MOVE IN CIRCLES**
**TO GET THINGS DONE**

From alum to zinc ore, there's a *better* way to size and screen bulk materials . . . in the sizes you need . . . at the capacity you want . . . at the speed you expect . . . with the accuracy you have a right to demand.

It's the Hewitt-Robins Vibrex® Vibrating Screen . . . the screen that moves in circles to get things done.

Circle-throw is one of a long list of Hewitt-Robins "firsts." So is elliptical throw. So is the full-floating principle of absorbing the vibration of the live frame. We pioneered in both 2-bearing and 4-bearing vibrators. Such advances have made the name Hewitt-Robins synonymous with top performance in vibrating machinery.

The instant coffee that brightens your breakfast table . . . the sand and stone that build mighty dams . . . the lanolin that nourishes your skin . . . shiploads of oil from far-off Africa—these and hundreds of other essentials of social and industrial life are processed, screened, purified and sized on Hewitt-Robins Vibrating Screens.

Whatever your screening problem—whether it involves tiny specks or multi-ton boulders—make it *ours*.

**HEWITT HR ROBINS**

*Executive Offices:* 370 Lexington Avenue, New York 17, N. Y.

**HEWITT RUBBER DIVISION:** Belting, hose and other industrial rubber products
**ROBINS CONVEYORS DIVISION:** Conveying, screening, sizing, processing and dewatering machinery
**ROBINS ENGINEERS DIVISION:** Designing and engineering of materials handling systems

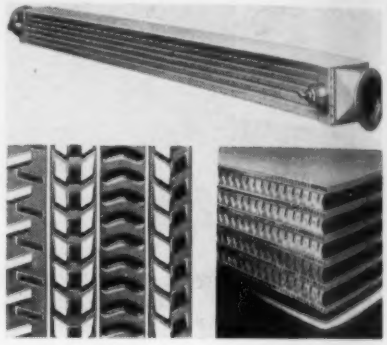
Hewitt-Robins is participating in the management and financing of Kentucky Synthetic Rubber Corporation


# *new equipment*

***Continued***

veyer known as the Press-Vator. The device is a small, cleated conveyer known as the Press-Vator. justable to various loading and unloading heights. As parts drop from the stamping press they are automatically picked up by the Press-Vator and delivered to a tote box or truck, or elevated to a gravity chute leading to the next operation. Four 6 and 8-ft models are available. The frame is welded heavy gage steel. No floor bolts or locks are required. *E. W. Buschman Co.*

**For more data insert No. 21 on postcard, p. 35.**



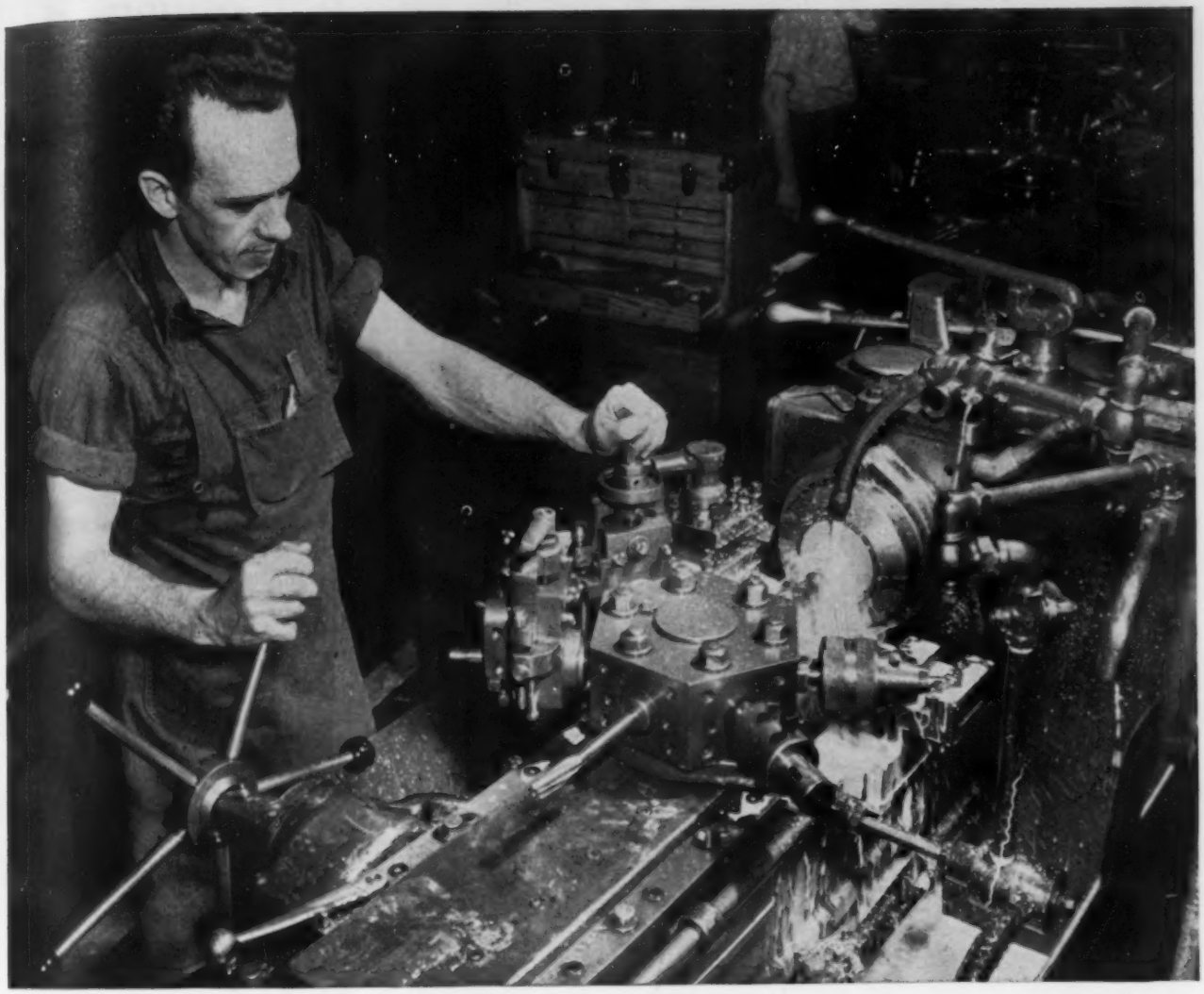
## Solvent recovery unit

New plate type heat exchangers especially designed for solvent recovery incorporate interlocked channel type fins with special embossings or interrupted surfaces that provide high concentration of surface for low weight and volume. Surface area ranges from 250 to 300 sq ft per cu ft, permitting cost savings over conventional heat exchangers used for solvent recovery. The units are easily assembled into blocks to accommodate different capacity requirements. *Modine Mfg. Co.*

**For more data insert No. 22 on postcard, p. 35.**

## Weld-aid lens

The lens helps operators who depend on bifocal glasses for near vision by supplying clear and unobstructed near vision over the entire area of the window in the welding helmet. It replaces the unusable segment power of the

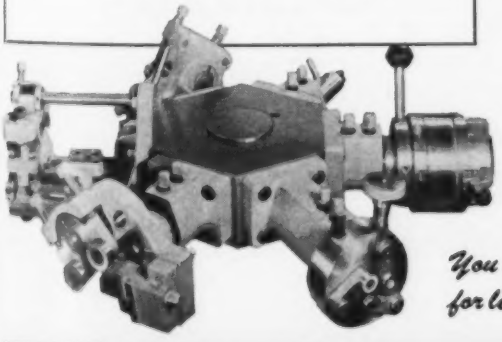


# PICTURE OF A MAN PRODUCING 25% MORE

## Same job, same operation, *But Better Tools!*

This shop has found it can do more jobs faster on Warner & Swasey Turret Lathes with the Standard Tooling Setups that fit their requirements. Multiple and combined cuts, with shorter setup time, mean profitable production increases.

● Electrol Incorporated, of Kingston, New York, transferred this precision Stop-Plunger job to a Warner & Swasey No. 3 Universal Turret Lathe because it had the speed and accuracy required, as well as the proper tooling for the job. The result was a 25% increase in production of this high pressure hydraulic control part.

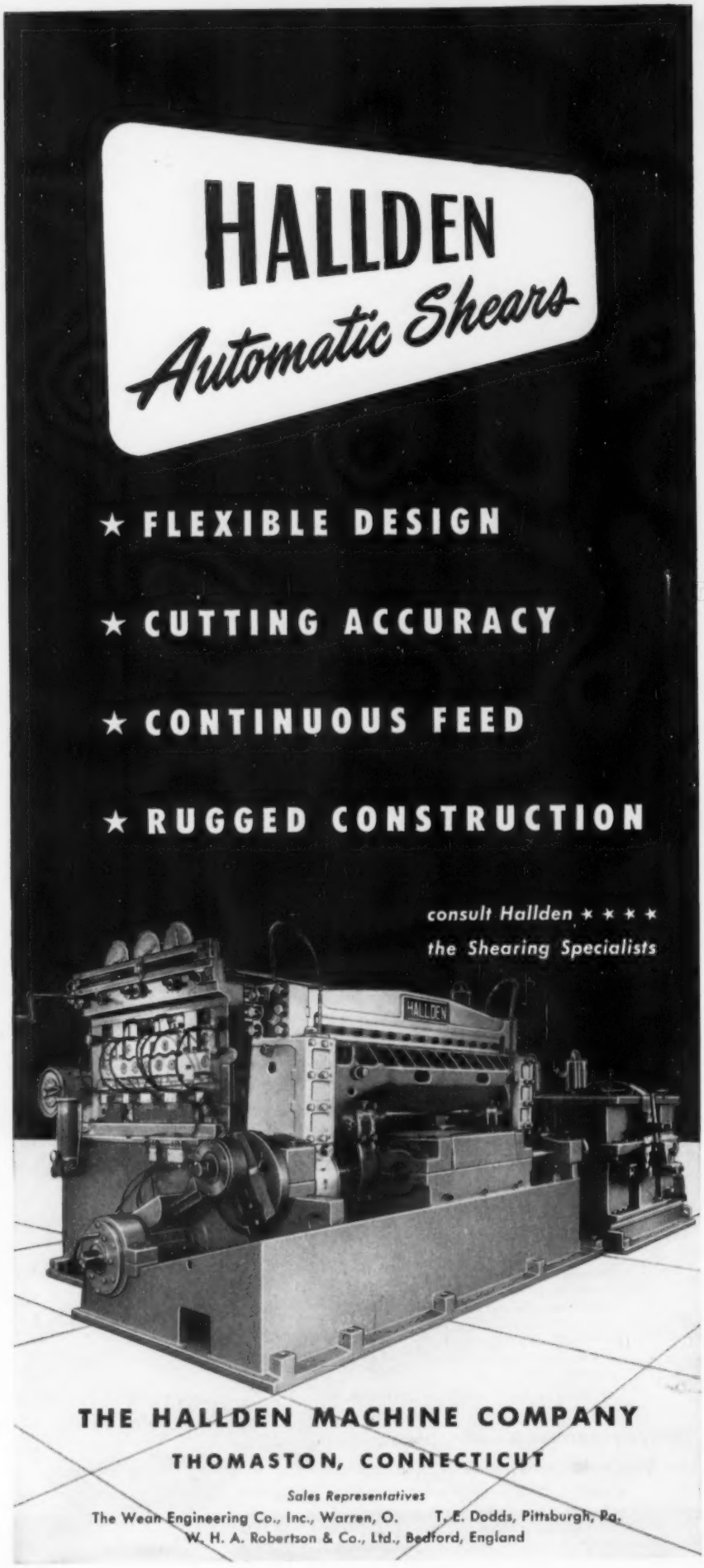


Permanent Universal Tooling setups and the right tools which can help you increase your output are all in the new 194 page Warner & Swasey Tool Catalog. Write for your copy.

*You can machine it better, faster, for less... with a Warner & Swasey*

**WARNER & SWASEY**
Machine Tools
*Cleveland*

TURRET LATHES, MULTIPLE & SINGLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES





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# *new equipment*

*Continued*

welder's prescription glasses. The lens is high grade optical glass ground to a specific power and mounted securely in a durable plastic frame that fits into the average welding helmet. Two sizes and five powers are available. *Willson Products, Inc.*

**For more data insert No. 23 on postcard, p. 35.**

## Punch press feeders

An improved line of vacuum lifters for punch press feeding and other production uses prevents finger and hand injuries and speeds up the work. They may be used on non-porous, rigid materials, flat or curved surfaces. Feeders are light, easy to handle and respond instantly. A slight blow affixes the vacuum cup to the blank being handled; releases instantly by depressing the thumb lever. *Industrial Products Co.*

**For more data insert No. 24 on postcard, p. 35.**

## Ox bow magnet chain

Two new ox bow magnet chains have been designed for handling materials with electro-magnets. Both 1-in. and 1¼-in. chains are alloy steel and heat treated to 125,000 psi tensile strength. An Alemite flush fitting for lubrication reduces friction to a minimum. The reach of the ox bow can be increased in multiples of two links or 5½ in. on the 1-in. chain and two links or 6⅜ in. on the 1¼-in. chain. *American Chain Div. American Chain & Cable Co., Inc.*

**For more data insert No. 25 on postcard, p. 35.**

## Abrasive disks

Dura-Cut multiple layer abrasive disks for use on portable grinders and disk sanders are flexible, strong, safe. Segment pattern for maximum freedom of chip disposal gives cooler cutting for better finish. Disks withstand long continued flexing because of the extra strong reinforced backing material. Faster, sustained rate of cut is another advantage. *Bay State Abrasive Products Co.*

**For more data insert No. 26 on postcard, p. 35.**

***Resume Your Reading on Page 39***

# IRON AGE *markets and prices*

*market briefs and bulletins*

**tungsten steel prices**—Tungsten-bearing high-speed steels will go up in price, probably sometime in June. Cost of ferrotungsten has been pegged at $5 per lb for standard grades, compared with $3.25 previously. The Tool Steel Industry Advisory Board's recommendation for a hike has cleared OPS and is now in the hands of U. S. attorneys. Hard-faced welding rods are also slated for an increase.

**steel shipments**—Railroads took a big bite out of first quarter, 1951, steel shipments—1,539,000 net tons, 700,000 tons more than the same period in 1950. American Iron & Steel Institute reports show oil and gas drilling took 214,000 tons, up 50 pct from last year. Biggest percentage gains were recorded in shipbuilding, aircraft and ordnance. Ordnance producers received 180,000 tons, 15 times the 1950 amount. Total steel shipments for the quarter were 19,736,249 tons, almost 4.4 million tons more than 1951 shipments.

**on the Mississippi**—A new era in Mississippi River navigation is in the making. Passage of the *Cliffs Victory*, a 602-ft freighter, and the *Daniel Pierce*, a 391-ft oiler, up the river to the Great Lakes is blazing a trail for other large boats. Plans for passage of 30 more big ships along the same route in the coming year are reported in the making.

**steel stability?**—Canada is moving to stabilization of its steel supply, officials of the Dept. of Trade and Commerce announced in Toronto. One official admitted present need of steel was urgent but that higher domestic output and more from the U. S. had taken off some of the pressure. Another department representative stated no emergency program in Canada should suffer with supplies on hand and on way.

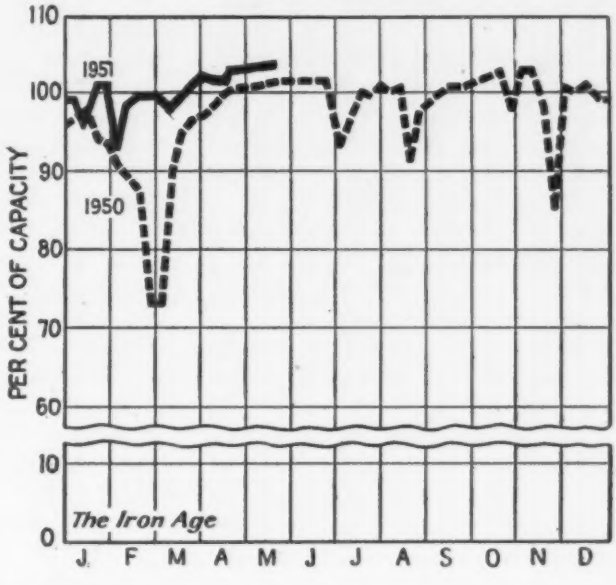
**facing scrap problem**—A joint committee representing foundries, scrap dealers and steel mills has been formed to deal with the critical scrap situation. The new Mobilization Committee for Iron and Steel Scrap will have as its chairman Robert W. Wolcott, of Lukens Steel Co.

**northwest aluminum**—Two potential primary aluminum producers are still in the running for plants in the Pacific Northwest. Industrialists are betting only one of the two will ever get into the field. They are Independent Aluminum Co. and Eastern Metals Products Co. Both have received commitments from Bonneville Power Administration for 80,000 kw of power, half firm and half interruptible—provided they show financial responsibility and signed contracts.

**lead time**—Steelmakers have been notified that required lead time for placing July orders has been shortened 15 days. This is to allow more time for processing requests for steel under CMP. As a result there will probably be considerable shuffling, but schedules at the mill aren't expected to be changed much.

**build new coke ovens**—Construction of 40 new coke ovens at the Merchant Coke Plant of the Great Lakes Carbon Corp. will, on completion, raise plant capacity 75 pct. Operation of the new ovens is expected to start in the summer of 1952.

**Steel Operations †**




**District Operating Rates—Per Cent of Capacity †**

| Week of | Pittsburgh | Chicago | Youngstown | Philadelphia | West | Buffalo | Cleveland | Detroit | Wheeling | South | Ohio River | St. Louis | East | Aggregate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| May 6 | 102.0* | 109.0* | 95.0* | 100.5 | 104.0 | 104.0 | 99.0* | 106.0 | 101.0 | 103.0 | 97.0 | 86.5 | 112.5 | 104.0 |
| May 13 | 103.0 | 107.0 | 95.0 | 100.5 | 107.0 | 104.0 | 95.5 | 106.0 | 101.0 | 97.0 | 95.5 | 86.5 | 125.0 | 104.0 |

* Revised.
† Beginning Jan. 1, 1951, operations are based on annual capacity of 104,229,650 net tons.

# nonferrous metals

*outlook and market activities*

## NONFERROUS METALS PRICES

| | May 9 | May 10 | May 11 | May 12 | May 14 | May 15 |
|---|---|---|---|---|---|---|
| Copper, electro, Conn. . . | 24.50 | 24.50 | 24.50 | 24.50 | 24.50 | 24.50 |
| Copper, Lake delivered . . | 24.625 | 24.625 | 24.625 | 24.625 | 24.625 | 24.625 |
| Tin, Straits, New York . . . . | $1.42 | $1.39 | $1.39 | . . . . | $1.39 | $1.39* |
| Zinc, East St. Louis . . . . . | 17.50 | 17.50 | 17.50 | 17.50 | 17.50 | 17.50 |
| Lead St. Louis . . . . . | 16.80 | 16.80 | 16.80 | 16.80 | 16.80 | 16.80 |

Note: Quotations are going prices.
*Tentative.

*by R.Hatschek*

**Copper Developments**—The copper scrap market has toned down slightly this week. Conversion demand is off to the extent of about 1¢ per lb as converters study their position in the nearing Controlled Materials Plan. They are not sure of smelters' deliveries after July 1, CMP's effective date, on material which they buy now.

**More Copper from Chile**—A larger share of Chilean copper is in store for this country as a result of recent government actions. First, the import tariff suspension needs only the President's signature to become a reality. Second is the agreement between the U. S. and Chile whereby we pay 3¢ per lb more for their copper.

In return for the extra 3¢, Chile has agreed not to sell to other countries at a lower price, will take no more than 20 pct of the production of American owned mines for domestic use or export, will not export to nations of the Communist bloc, will limit exports to friendly nations to essentials and will act to prevent re-exportation.

**Production Boost**—Industry is still waiting for the development of a plan for paying the higher price. The government, industry and the consumer are candidates for all or part of the extra 3¢ per lb. Actual purchase commitments are also awaiting the solution of this problem.

The State Dept. has promised priority aid for the procurement of equipment to expand Chile's production. Anaconda Copper Mining Co. and Kennecott Copper Corp. are already discussing expansion and a better tax set-up with the Chilean government. Smaller mines will also be supported by the U. S. government in this expansion program.

**RFC Dips Tin Price**—Last week the Reconstruction Finance Corp. once again dropped the price of tin—3¢ per lb this time, bringing the price to $1.39. The Singapore market declined only slightly and at the close of the week it stood at the c.i.f. New York equivalent of $1.43½. London was off a little more sharply.

**Report Torquay Results**—It is reported that the United States made mutually advantageous tariff agreements with 17 other nations at the conference at Torquay, England. Lasting almost 7 months, the international meeting ended on April 21.

Import duties on chromium, bismuth, vanadium, zirconium, thorium, silicon, and boron are to be reduced by 50 pct and zinc, aluminum, pig iron, ferromanganese and titanium duties are to be cut from 20 pct to 30 pct, it is reported. Effective dates of these tax cuts have not yet been established since not all countries have signed but it is expected that some of the new rates will go into effect in June.

**Ask Operations Reports**—National Production Authority has asked all users of copper or copper-base alloys to start filing monthly reports of operations, starting with April. This information is needed for use as a guide for CMP allotments. Forms are available from NPA Copper Div. in Washington. A similar system for aluminum should get under way shortly.

**M-22 Up for Changes**—NPA last week met with the Aluminum Producers Industry Advisory Committee and went over a proposed amendment to M-22, the aluminum scrap order. The amendment would provide a shot in the arm to scrap flow to wrought product fabricators. Industry men believe the revision will be useful in cutting the heavy drain on primary metal because of the scrap shortage.

## MILL PRODUCTS

*(Cents per lb, unless otherwise noted)*

### Aluminum

*(Base 30,000 lb, f.o.b. ship. pt. frt. allowed)*

**Flat Sheet:** 0.188 in., 2S, 3S, 30.1¢; 4S, 61S-O, 32¢; 52S, 34.1¢; 24S-O, 24S-OAL, 32.9¢; 75S-O, 75S-OAL, 39.9¢; 0.081 in., 2S, 3S, 31.2¢; 4S, 61S-O, 33.5¢; 52S, 35.6¢; 24S-O, 24S-OAL, 34.1¢; 75S-O, 75S-OAL, 41.8¢; 0.032 in., 2S, 3S, 32.9¢; 4S, 61S-O, 37.1¢; 52S, 39.8¢; 24S-O, 24S-OAL, 41.7¢; 75S-O, 75S-OAL, 52.2¢.

**Plate:** ¼ in. and heavier: 2S, 3S-F, 28.3¢; 4S-F, 30.2¢; 52S-F, 31.8¢; 61S-O, 30.8¢; 24S-O, 24S-OAL, 32.4¢; 75S-O, 75S-OAL, 38.8¢.

**Extruded Solid Shapes:** Shape factors 1 to 5, 36.2¢ to 74.6¢; 12 to 14, 36.9¢ to 89¢; 24 to 26, 39.6¢ to $1.16; 36 to 38, 47.2¢ to $1.70.

**Rod, Rolled:** 1.5 to 4.5 in., 2S-F, 3S-F, 37.5¢ to 38.5¢; cold-finished, 0.375 to 3 in., 2S-F, 3S-F, 40.5¢ to 35¢.

**Screw Machine Stock:** Rounds, 11S-T3, ⅛ to 11/32 in., 53.5¢ to 42¢; ⅜ to 1½ in., 41.5¢ to 39¢; 1 9/16 to 3 in., 38.5¢ to 36¢; 17S-T4 lower by 1.5¢ per lb. Base 5000 lb.

**Drawn Wire:** Coiled, 0.051 to 0.374 in., 2S, 39.5¢ to 29¢; 52S, 48¢ to 35¢; 56S, 51¢ to 42¢; 17S-T4, 54¢ to 37.5¢; 61S-T4, 48.5¢ to 37¢; 75S-T6, 84¢ to 67.5¢.

**Extruded Tubing, Rounds:** 63-S-T5, OD in in.: 1¼ to 2, 37¢ to 54¢; 2 to 4, 33.5¢ to 45.5¢; 4 to 6, 34¢ to 41.5¢; 6 to 9, 34.5¢ to 43.5¢.

**Roofing Sheet, Flat:** 0.019 in. x 28 in. per sheet, 72 in., $1.142; 96 in., $1.522; 120 in., $1.902; 144 in., $2.284. Gage 0.024 in. x 28 in., 72 in., $1.379; 96 in., $1.839; 120 in., $2.299; 144 in., $2.759. Coiled Sheet: 0.019 in. x 28 in., 28.2¢ per lb.; 0.024 in. x 28 in., 26.9¢ per lb.

### Magnesium

*(F.o.b. mill, freight allowed)*

**Sheet and Plate:** FS1-O, ¼ in. 63¢; 3/16 in. 65¢; ⅛ in. 67¢; B & S Gage 10, 68¢; 12, 72¢; 14, 78¢; 16, 85¢; 18, 93¢; 20, $1.05; 22, $1.27; 24, $1.67. Specification grade higher. Base: 10,000 lb.

**Extruded Round Rod:** M, diam in., ⅛ to 0.311 in., 74¢; ½ to ¾ in., 57.5¢; 1¼ to 1.749 in., 53¢; 2½ to 5 in., 48.5¢. Other alloys higher. Base: Up to ¾ in. diam, 10,000 lb; ¾ to 2 in., 20,000 lb; 2 in. and larger, 30,000 lb.

**Extruded Solid Shapes, Rectangles:** M. In weight per ft, for perimeters less than size indicated, 0.10 to 0.11 lb, 3.5 in., 62.3¢; 0.22 to 0.25 lb, 5.9 in., 59.3¢; 0.50 to 0.59 lb, 8.6 in., 56.7¢; 1.8 to 2.59 lb, 19.5 in., 53.8¢; 4 to 6 lb, 28 in., 49¢. Other alloys higher. Base, in weight per ft of shape: Up to ½ lb, 10,000 lb; ½ to 1.80 lb, 20,000 lb; 1.80 lb and heavier, 30,000 lb.

**Extruded Round Tubing:** M, wall thickness, outside diam, in., 0.049 to 0.057, ¼ in. to 5/16, $1.40; 5/16 to ⅜, $1.26; ½ to ⅝, 93¢; 1 to 2 in., 76¢; 0.165 to 0.219, ⅝ to ⅞, 81¢; 1 to 2 in., 57¢; 3 to 4 in., 56¢. Other alloys higher. Base, OD in in.: Up to 1½ in., 10,000 lb; 1½ in. to 3 in., 20,000 lb; 3 in. and larger, 30,000 lb.

### Titanium

*(10,000 lb base, f.o.b. mill)*

Commercially pure and alloy grades: Sheet and strip, HR or CR, $15; Plate, HR, $12; Wire, rolled and/or drawn, $10; Bar, HR or forged, $6; Forgings, $6.

### Nickel and Monel

*(Base prices, f.o.b. mill)*

| | "A" Nickel | Monel |
|---|---|---|
| Sheets, cold-rolled | 71½ | 57 |
| Strip, cold-rolled | 77½ | 60 |
| Rods and bars | 67½ | 55 |
| Angles, hot-rolled | 67½ | 55 |
| Plates | 69½ | 56 |
| Seamless tubes | 100½ | 90 |
| Shot and blocks | .... | 50 |

### Copper, Brass, Bronze

*(Freight prepaid on 200 lb includes duty)*

| | Sheet | Rods | Extruded Shapes |
|---|---|---|---|
| Copper | 41.03 | .... | 40.63 |
| Copper, h-r | .... | 36.88 | .... |
| Copper, drawn | .... | 38.18 | .... |
| Low brass | 39.15 | 38.84 | .... |
| Yellow brass | 38.28 | 37.97 | .... |
| Red brass | 40.14 | 39.83 | .... |
| Naval brass | 43.08 | 38.61 | 38.07 |
| Leaded brass | .... | 32.63 | 36.70 |
| Com'l bronze | 41.13 | 40.82 | .... |
| Mang. bronze | 45.96 | 40.65 | 41.41 |
| Phos. bronze | 60.20 | 60.45 | .... |
| Muntz metal | 40.43 | 36.74 | 37.99 |
| Ni silver, 10 pct | 49.27 | 51.49 | .... |
| Arch. bronze | .... | .... | 35.11 |

## PRIMARY METALS

*(Cents per lb, unless otherwise noted)*

| | |
|---|---|
| Aluminum ingot, 99+%, 10,000 lb, freight allowed | 19.00 |
| Aluminum pig | 18.00 |
| Antimony, American, Laredo, Tex. | 42.00 |
| Beryllium copper, 3.75-4.25% Be | $1.56 |
| Beryllium aluminum 5% Be, Dollars per lb contained Be | $69.00 |
| Bismuth, ton lots | $2.25 |
| Cadmium, del'd | $2.55 |
| Cobalt, 97-99% (per lb) | $2.10 to $2.17 |
| Copper, electro, Conn. Valley | 24.50 |
| Copper, Lake, delivered | 24.625 |
| Gold, U. S. Treas., dollars per oz. | $35.00 |
| Indium, 99.8%, dollars per troy oz. | $2.25 |
| Iridium, dollars per troy oz. | $200 |
| Lead, St. Louis | 16.80 |
| Lead, New York | 17.00 |
| Magnesium, 99.8+%, f.o.b. Freeport, Tex., 10,000 lb | 24.50 |
| Magnesium, sticks, 100 to 500 lb | 42.00 to 44.00 |
| Mercury, dollars per 76-lb flask, f.o.b. New York | $215-$220 |
| Nickel, electro, f.o.b. New York | 53.55 |
| Nickel oxide sinter, f.o.b. Copper Cliff, Ont., contained nickel | 46.75 |
| Palladium, dollars per troy oz. | $24.00 |
| Platinum, dollars per troy oz. | $90 to $93 |
| Silver, New York, cents per oz. | 90.16 |
| Tin, New York | $1.39 |
| Titanium, sponge | $5.00 |
| Zinc, East St. Louis | 17.50 |
| Zinc, New York | 18.25 |
| Zirconium copper, 50 pct | $6.20 |

## REMELTED METALS

### Brass Ingot

*(Cents per lb delivered, carloads)*

| | |
|---|---|
| 85-5-5-5 ingot | |
| No. 115 | 29.00 |
| No. 120 | 28.50 |
| No. 123 | 28.00 |
| 80-10-10 ingot | |
| No. 305 | 35.00 |
| No. 315 | 32.00 |
| 88-10-2 ingot | |
| No. 210 | 47.50 |
| No. 215 | 44.50 |
| No. 245 | 37.00 |
| Yellow ingot | |
| No. 405 | 25.50 |
| Manganese bronze | |
| No. 421 | 32.75 |

### Aluminum Ingot

*(Cents per lb, 30,000 lb lots)*

| | |
|---|---|
| 95-5 aluminum-silicon alloys | |
| 0.30 copper, max. | 34.50-36.25 |
| 0.60 copper, max. | 34.25-36.00 |
| Piston alloys (No. 122 type) | 31.00-32.50 |
| No. 12 alum. (No. 2 grade) | 30.25-31.25 |
| 108 alloy | 31.50-32.00 |
| 195 alloy | 32.50-33.00 |
| 13 alloy | 34.50-36.00 |
| ASX-679 | 31.50-33.25 |

### Steel deoxidizing aluminum, notch-bar granulated or shot

| | |
|---|---|
| Grade 1—95.97½% | 32.50-33.50 |
| Grade 2—92-95% | 31.50-32.50 |
| Grade 3—90-92% | 30.50-31.50 |
| Grade 4—85-90% | 29.50-30.50 |

## ELECTROPLATING SUPPLIES

### Anodes

*(Cents per lb, freight allowed, 500 lb lots)*

| | |
|---|---|
| Copper | |
| Cast, oval, 15 in. or longer | 39½ |
| Electrodeposited | 33⅜ |
| Rolled, oval, straight, delivered | 38⅞ |
| Forged ball anodes | 43 |
| Brass, 80-20 | |
| Cast, oval, 15 in. or longer | 34¾ |
| Zinc, oval | 26½ |
| Ball anodes | 25½ |
| Nickel 99 pct plus | |
| Cast | 70.50 |
| Rolled, depolarized | 71.50 |
| Cadmium | $2.80 |
| Silver 999 fine, rolled, 100 oz lots, per troy oz, f.o.b. Bridgeport, Conn. | 79½ |

### Chemicals

*(Cents per lb, f.o.b. shipping points)*

| | |
|---|---|
| Copper cyanide, 100 lb drum | 52.15 |
| Copper sulfate, 99.5 crystals, bbl. | 12.85 |
| Nickel salts, single or double, 4-100 lb bags, frt. allowed | 20½ |
| Nickel chloride, 375 lb drum | 27½ |
| Silver cyanide, 100 oz lots, per oz. | 67¼ |
| Sodium cyanide, 96 pct domestic 200 lb drums | 19.25 |
| Zinc cyanide, 100 lb drums | 45.35 |

## SCRAP METALS

### Brass Mill Scrap

*(Cents per pound, add ½¢ per lb for shipments of 20,000 to 40,000 lb; add 1¢ for more than 40,000 lb)*

| | Heavy | Turnings |
|---|---|---|
| Copper | 22 | 22¼ |
| Yellow Brass | 20½ | 18¾ |
| Red brass | 21½ | 20¾ |
| Comm. bronze | 21¾ | 21 |
| Mang. bronze | 19½ | 18¾ |
| Brass rod ends | 19⅞ | .... |

### Custom Smelters' Scrap

*(Cents per pound, carload lots, delivered to refinery)*

| | |
|---|---|
| No. 1 copper wire | 21.50 |
| No. 2 copper wire | 20.00 |
| Light copper | 19.00 |
| Refinery brass | 19.50* |
| Radiators | 15.00 |

*Dry copper content.

### Ingot Makers' Scrap

*(Cents per pound, carload lots, delivered to producer)*

| | |
|---|---|
| No. 1 copper wire | 28.00-29.00 |
| No. 2 copper wire | 25.00-26.00 |
| Light copper | 23.50-24.50 |
| No. 1 composition | 25.00-25.50 |
| No. 1 comp. turnings | 24.50-25.00 |
| Rolled brass | 19.00 |
| Brass pipe | 20.50 |
| Radiators | 19.00-19.50 |
| Heavy yellow brass | 19.00-19.50 |
| *Aluminum* | |
| Mixed old cast | 21 —22 |
| Mixed new clips | 24 —25 |
| Mixed turnings, dry | 21 —21½ |
| Pots and Pans | 21 —22 |
| Low copper | 15 |

### Dealers' Scrap

*(Dealers' buying prices, f.o.b. New York in cents per pound)*

| | |
|---|---|
| **Copper and Brass** | |
| No. 1 heavy copper and wire | 25½ —26½ |
| No. 2 heavy copper and wire | 24 —25 |
| Light copper | 22 —22½ |
| New type shell cuttings | 22 —22½ |
| Auto radiators (unsweated) | 17½ —18 |
| No. 1 composition | 22 —23 |
| No. 1 composition turnings | 21 —22 |
| Clean red car boxes | 19 —19½ |
| Cocks and faucets | 19 —19½ |
| Mixed heavy yellow brass | 16½ —17 |
| Old rolled brass | 18½ —19 |
| Brass pipe | 20 —20½ |
| New soft brass clippings | 20 —21 |
| Brass rod ends | 19½ |
| No. 1 brass rod turnings | 19 |
| **Aluminum** | |
| Alum. pistons and struts | 14 —14½ |
| Aluminum crankcases | 17 —17½ |
| 2S aluminum clippings | 21½ —22 |
| Old sheet and utensils | 17 —17½ |
| Borings and turnings | 13 —14 |
| Misc. cast aluminum | 17 —17½ |
| Dural clips (24S) | 17 —17½ |
| **Zinc** | |
| New Zinc clippings | 17 —18 |
| Old Zinc | 12½ —13 |
| Zinc routings | 8½ — 9 |
| Old die cast scrap | 8 — 8½ |
| **Lead** | |
| Soft scrap, lead | 16½ —16¾ |
| Battery plates (dry) | 9½ —10 |
| **Miscellaneous** | |
| Block tin | 110 —120 |
| No. 1 pewter | 80 —85 |
| No. 1 auto babbitt | 75 —80 |
| Mixed common babbitt | 16 —17 |
| Solder joints | 23 —24 |
| Siphon tops | 75 —80 |
| Small foundry type | 18¾ —19 |
| Monotype | 17½ —18 |
| Lino. and stereotype | 17 |
| Electrotype | 15¾ —16 |
| Hand picked type shells | 11½ —11¾ |
| Lino. and stereo. dross | 9½ —10 |
| Electro. dross | 7½ — 8 |

### Scrap Nickel & Monel Ceilings

*(F.o.b. shipping pt., cents per lb*)*

| | |
|---|---|
| Pure nickel | 40½ |
| New Monel clips, rods | 33 |
| Old & soldered Monel sheet | 28 |
| No. 1 Monel castings, turnings | 26 |
| K & S Monel clips, rods | 31 |
| K & S Monel turnings | 24 |

*Add ½¢ per lb for nickel shipments over 2000 lb, for Monel shipments over 20,000 lb. Converter's premium of 4¢ per lb is allowed for these grades.

# SCRAP *iron and steel*

*markets prices trends*

**Reports of critical supply increase . . . Some plants are down to 3-days . . . Pittsburgh mills bounce some cars.**

Reports of still-stumbling stockpiles are being circulated apprehensively this week. Some consumers are complaining that they are in the shadow of falling melt schedules. They are watching the railroad sidings for their next freightload of allocated material.

Some Pittsburgh plants are down to a 3-day inventory. What has saved the day in some cases was opportune arrival of allocated scrap. Allocations are the great equalizer of stockpiles—but sometimes it takes dangerously long because of cross-hauling.

With production cutbacks nipping at their heels, some in the trade are willing to see the ceiling on scrap prices jacked higher to let more scrap in. Others maintain that this step would perform a short service, liberating a little scrap at the onset but soon swinging back to normal collections.

Collection of marginal scrap could stand a little aid. No one can go through the costly process of tearing up street car tracks and still sneak in under the price wire. Collection of these fringe grades could be stimulated by some form of U. S. semi-subsidy.

Despite crucially tight supply, some Pittsburgh mills put their glasses on and bounced 42 carloads and one barge of scrap. Upgrading has swept through the market and some dealers cite the shortage and the difficulty of collecting good heavy scrap.

**PITTSBURGH**—A large scrap consumer here is maintaining operations "by the skin of our teeth." Some plants are down to a 3-day inventory. Only the timely arrival of allocated scrap averted a cutback in melting schedules. Despite tight supply, it is reported mills are tightening up on inspection. One mill downgraded 250 cars in the last 2 months, and rejected 42 cars and one barge. Some cars contain so many grades that it is extremely difficult to determine proper classification. This has led to interminable wrangling between the mills and dealers before a none-too-happy compromise is reached.

**CHICAGO**—Mills and foundries in the area continue to live on a hand to mouth basis, with inventories still slipping. One major consumer is reported down to a 10-day supply. Movement of dealer and industrial scrap is moderate but just not great enough to meet high production rates of the mills. Almost all industrial scrap is going on allocation while a greater percentage of dealer scrap is going on allocation each day. Part of the shortage is due to the fact that some industries are buying more new steel than they need for immediate production thus cutting down on the amount of scrap generated.

**PHILADELPHIA** — Demand remains high in this area and a fair volume of light scrap is moving. Lack of sufficient heavy material is the bugaboo. OPS inspectors have finally showed up here and have done some regrading of No. 1 steel to No. 2. It is rumored OPS is considering a single price of $49 per gross ton for all cast grades while strong pressure is being brought to bear for a similar action on openhearth grades.

**NEW YORK**—Supply continues moderate and demand climbs to the upper-upper brackets, far outclassing supply. Last week the Scrap Committee of the American Iron & Steel Institute met to figure out some scrap collection campaigns. What would help is an appeal to patriotism, not as intense now as in World War II. Industrial scrap collections through dealers are down and shipyards are not turning out as much scrap as in World War II.

**DETROIT**—The Detroit scrap market is quiet at the moment. Inquiries have failed to disclose any visits by government inspectors to this area. Open market buying of scrap has been discouraged somewhat by upgrading, according to trade reports and the amount of scrap moving under allocation appears to be increasing.

**CLEVELAND**—Consumers are squeezing by here and in the Valley at capacity operations this week, but the optimism of the past month has evaporated. One Valley consumer has a 3-day inventory and at least one other is close to the danger line. A few are getting approximately their consumption back in shipments but it's a nip and tuck situation. A rough summer is shaping up with no immediate improvement in the supply picture in prospect. In the trade, there is talk of closing some scrap yards, for lack of material to prepare. The price is high enough, it is simply a shortage of material. Foundries are battling for every ton.

**ST. LOUIS**—Movement of scrap iron to the St. Louis industrial district has improved but still falls far short of mill requirements. Mill stocks are lean. Allocations are also short of requirements. Railroad lists are smaller as carriers show continued prudence in dismantling of equipment. The supply of rails for re-rolling is also low because railroads are not laying new rails. This has been attributed to late deliveries and a shortage of labor.

**BIRMINGHAM** — Allocations of scrap from this district to Pittsburgh and Ohio Valley mills are siphoning off the already too-scanty supplies for local mills and foundries. Foundries are continuing to dig into stockpiles, particularly for No. 1 cast. Some indicate it may be necessary to ask for allocations unless more scrap comes into the district.

**CINCINNATI**—Scrap is moving fast in this district but available tonnage is far short of demand. At the moment, no consumer is seriously short, which has become another way of saying that he has a week's inventory on the ground. Foundries are hurting and the shortage of rails is becoming more acute. No immediate change in the supply picture is in prospect.

**BOSTON**—Warmer weather and better collections have worked hand in hand with mill demand which is taking everything available in the local scrap market.

**BUFFALO** — Allocations handicap and help mills here. Scrap from southern and middle sections of the state are bypassing local users and going to the Valley. But heavy water shipments under allocations are scheduled to arrive from the coast via canal and from Upper Lake points. Stocks are down to 2 and 3 weeks.

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